NOAA Technical Memorandum NMFS-SEFC-116

Size Composition of Monthly Catches of Brown Shrimp from the Texas Coast, Mississippi River to Texas, and Pensacola to the Mississippi River, 1960-1981.

By

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INTRODUCTION

Christmas and Etzold (1977) and the Gulf of Mexico Fishery Management Council (GMFMC, 1980) have summarized much of the available information concerning the biology and population dynamics of brown shrimp in the context of management of the fishery for this species in the Gulf of Mexico. The size composition of the reported monthly catches of brown shrimp, Penaeus aztecus, reflects the combined effects of recruitment, growth and mortality, including losses due to natural causes and those caused by fishing. Annually recurring recruitment has an obvious effect of reducing the size of brown shrimp in the monthly catches, but the time-phasing of open seasons and the intensity of fishing also can alter the size composition patterns (Caillouet and Koi, 1981 and 1983; Caillouet, Patella and Jackson, 1979 and 1980).

The seasonal patterns in the monthly catches of brown shrimp vary from year to year and area to area, depending upon climatic conditions, recruitment, survival, and growth of the shrimp, the timing and duration of open seasons, and the intensity of fishing during open seasons set by State and Federal shrimp management agencies (Caillouet and Koi, 1982). Caillouet and Koi (1982) graphically portrayed the cumulative monthly catches, the cumulative ex-vessel value of the catches, and the average monthly ex-vessel price per pound for this species to elucidate these seasonal patterns, as well as year to year trends.

Ex-vessel value of the brown shrimp catch is strongly linked to the size composition of the catch (Caillouet and Koi, 1981, 1983; Caillouet and Patella, 1978; Caillouet, Patella and Jackson, 1979 and 1980) as well as total weight of the catch. In addition, the seasonal variations in local supply of shrimp influence the price, and thus the ex-vessel value of the catch (Poffenberger, 1982a, 1982b).

The purposes of this paper are to summarize available brown shrimp catch statistics by size categories, and to portray graphically the

monthly size composition of the catches from the Texas Coast, Mississippi River to Texas, and Pensacola to the Mississippi River for calendar years 1960 through 1981. For this purpose, we used combined inshore (landward of barrier islands) and offshore (seaward of barrier islands) catches. These graphically portrayed summaries should quickly convey information on the monthly patterns and trends in size composition of the brown shrimp catches. They also can be compared, month by month, with the information in our previously published graphs (Caillouet and Koi, 1982).

METHODS

Description of Data

Monthly summations of reported catches (inshore and offshore combined) of brown shrimp by size category were compiled from data files available from the NMFS, Southeast Fisheries Center (SEFC), Fisheries Information Management Division (FIMD), Miami, Florida. The weight of each monthly catch was expressed in pounds (heads off) distributed among eight size categories (≤15, 15-20, 21-25, 26-30, 31-40, 41-50, 51-67, and ≥68 shrimp tails per pound), usually referred to as "count". As an example, the catch of brown shrimp from the Texas Coast in the month of August 1981 is shown by size categories in Table 1. Monthly summations were obtained for each of three coastal areas (Fig. 1) distinguished as follows:

(1) Texas Coast (Statistical areas 18-21 combined),

(2) Mississippi River to Texas (Statistical areas 13-17 combined), representing that part of the Louisiana coast west of the Mississippi River, and

(3) Pensacola to the Mississippi River (Statistical areas 10-12 combined), representing that part of the Louisiana coast east

Table 1. Distribution of the brown shrimp catch (inshore and offshore combined) by size category for the Texas Coast in August 1981.

	Size Category (number of shrimp per pound, heads off)								
	>68	51-67	41-50	31-40	26-30	21-25	15-20	<15	Totals
Weight (thousands of pounds, heads off)	406	1,839	1,601	6,668	2,321	1,317	341	39	14,532
Percentage by weight	2.8	12.6	11.0	45.9	16.0	9.1	2.3	0.3	100.0
Cumulative percentage by weight	2.8	15.4	26.4	72.3	88.3	97.4	99.7	100.0	-

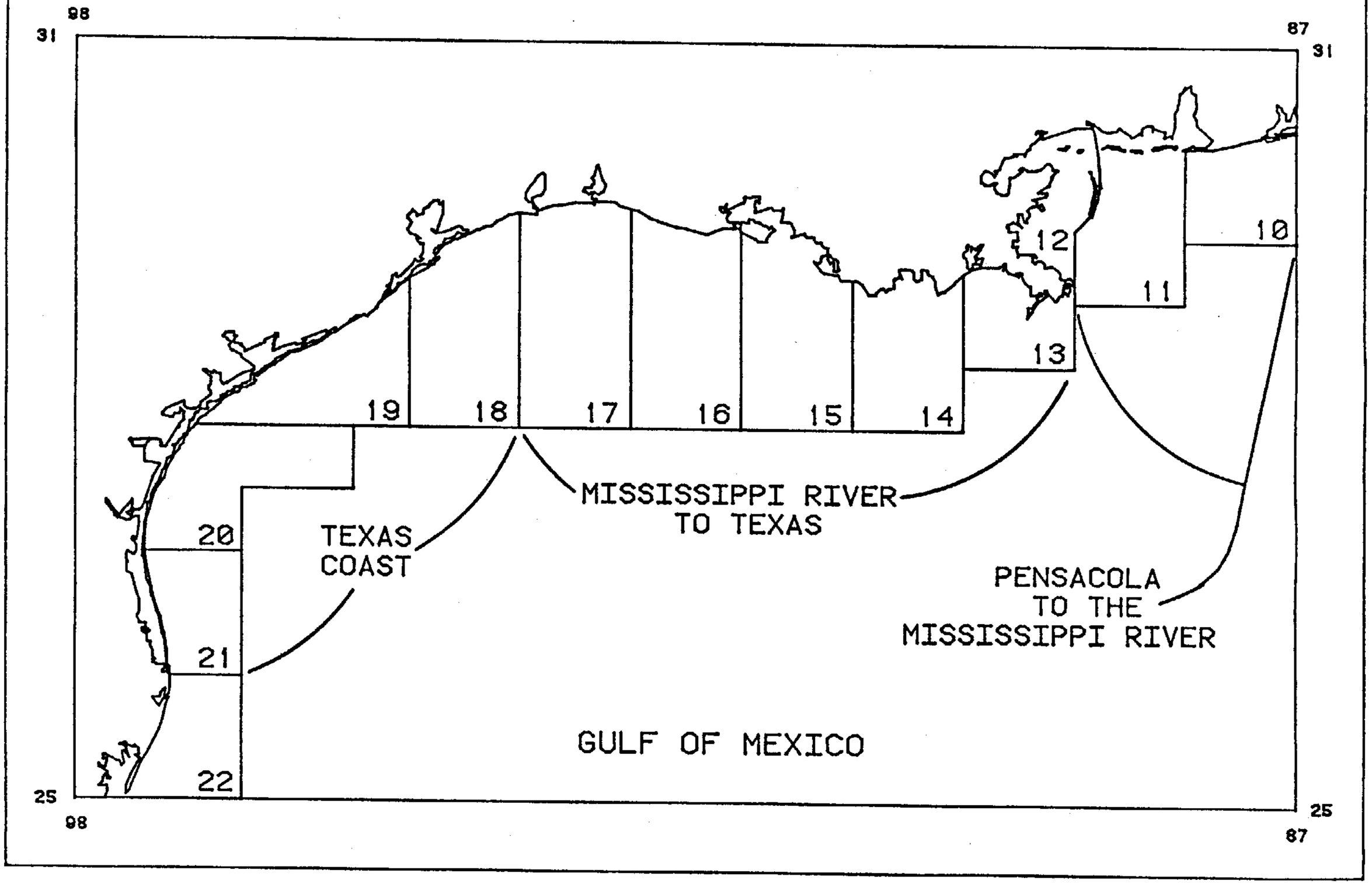

Figure 1. Boundaries of statistical areas 10-21, and three coastal regions (Texas Coast, Mississippi River to Texas, and Pensacola to the Mississippi River).

of the Mississippi River, the Mississippi coast, the Alabama coast, and a small part of the upper west coast of Florida (catches from Pensacola Bay are not included in this area; they are allocated to the adjacent Apalachicola area by the FIMD).

The percentages of the monthly catch (by weight) represented by each of the eight size categories were calculated, then the cumulative percentages by size category were derived for each month as exemplified in Table 1 for August 1981.

For each coastal area and year, the cumulative percentage (by weight) of the monthly catch of brown shrimp for each size category was plotted by month (see graphs). Thus, on any given graph, the bottommost line connects the monthly percentages for shrimp in the $\underline{>}$68 count category. The line immediately above it connects the combined monthly percentages for both the $\underline{>}$68 count and 51-67 count categories, and so on. The top line (100%) on each graph connects the combined monthly percentages for the all size categories. Thus, the distance between lines reflects the actual monthly percentage (by weight) taken in a given count category.

For each year, in consecutive order from 1960 through 1981, the graphs contained in this report are grouped in triplicates (one graph for each coastal area): the first for the Texas Coast, the second for the Mississippi River to Texas, and the third for Pensacola to the Mississippi River.

GENERAL OBSERVATIONS

The most prominent feature on all of the graphs was the dramatic upsurge in percentage of the catch represented by the smallest shrimp ($\underline{>}$ 68 per pound, or $\underline{>}$ 68 count), which usually (but not always) appeared in May or June. Minor upsurges in percentage of the smallest shrimp sometimes occurred in fall and winter, especially in the earlier years of the series. The major upsurges in percentage of

smallest shrimp obviously represented recruitment. In some years, a series of successive peaks, representing growth of the shrimp into successively lower count classes (i.e., consecutively larger sizes), occurred over several months.

There also were striking differences among the three coastal areas with regard to the magnitude of the upsurge in percentage of smallest shrimp (≥ 68 count). The most pronounced upsurge in this percentage occurred in the Mississippi River to Texas coastal area. It was usually of an intermediate level for Pensacola to the Mississippi River, and was lowest for the Texas Coast (note: for the Texas Coast in 1960, this percentage was barely detectable). These differences undoubtedly reflected the well-known differences in fishing regulations and strategies among the three coastal areas (Caillouet and Koi, 1981, 1983; Caillouet and Patella, 1978; Caillouet et al, 1979, 1980).

The graphs in this report may be used in conjunction with those of our previous publication (Caillouet and Koi, 1982) which showed the changes in weight, value and price per pound of the monthly catch. The two papers together depict the fluctuations in catch and its size composition from month to month over the same period of years. Fisheries scientists and managers should find them useful in interpreting seasonal patterns in the contexts of the life cycle of brown shrimp and changes in State and Federal management practices over the years.

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BROWN SHRIMP
TEXAS COAST
1960

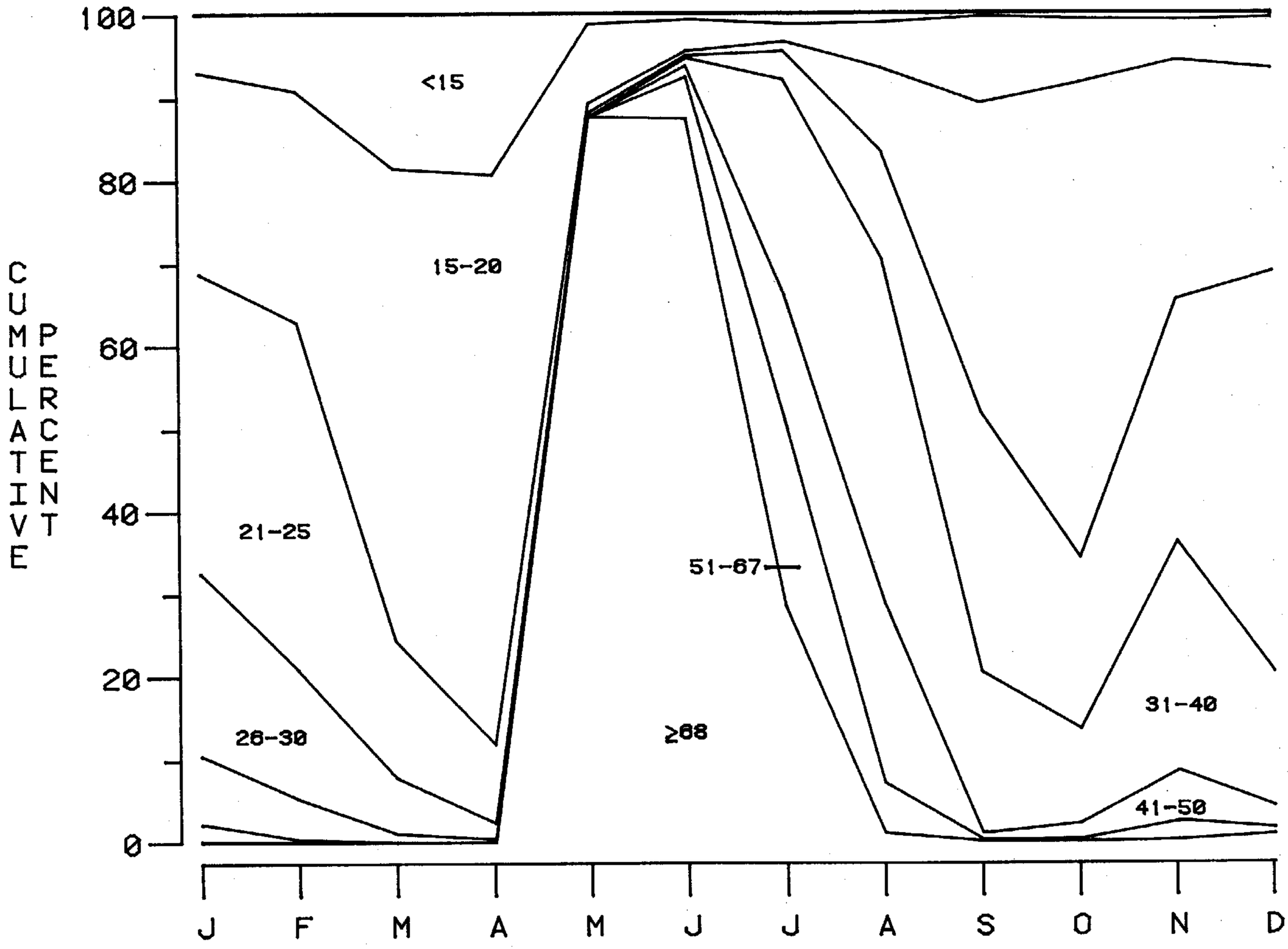
CUMULATIVE PERCENT

100
80
60
40
20
0

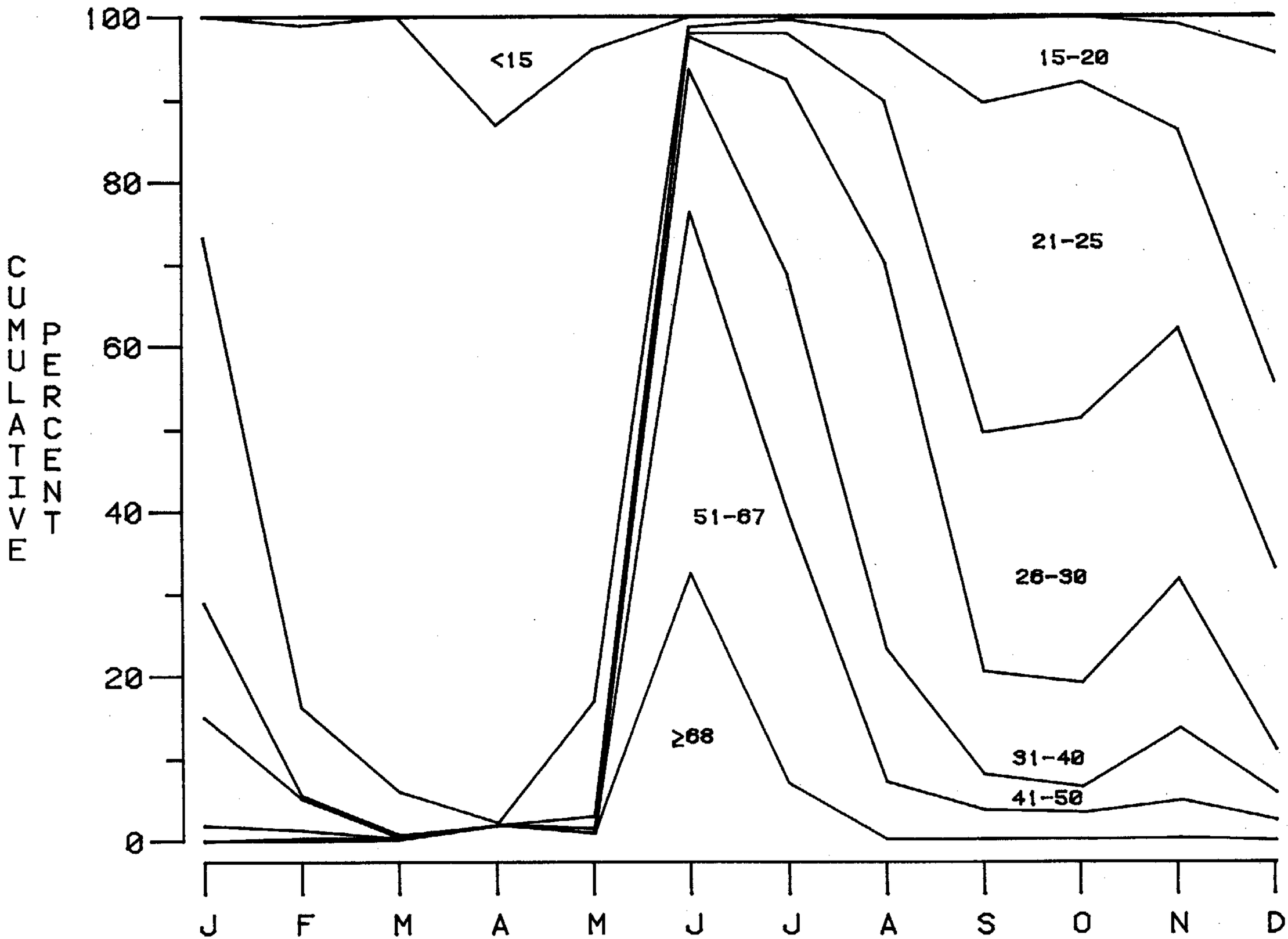
<15
15-20
21-25
26-30
31-40
41-50
51-67
≥68

J F M A M J J A S O N D

BROWN SHRIMP
MISSISSIPPI RIVER TO TEXAS
1960



BROWN SHRIMP
PENSACOLA TO THE MISSISSIPPI RIVER
1960



BROWN SHRIMP
TEXAS COAST
1961

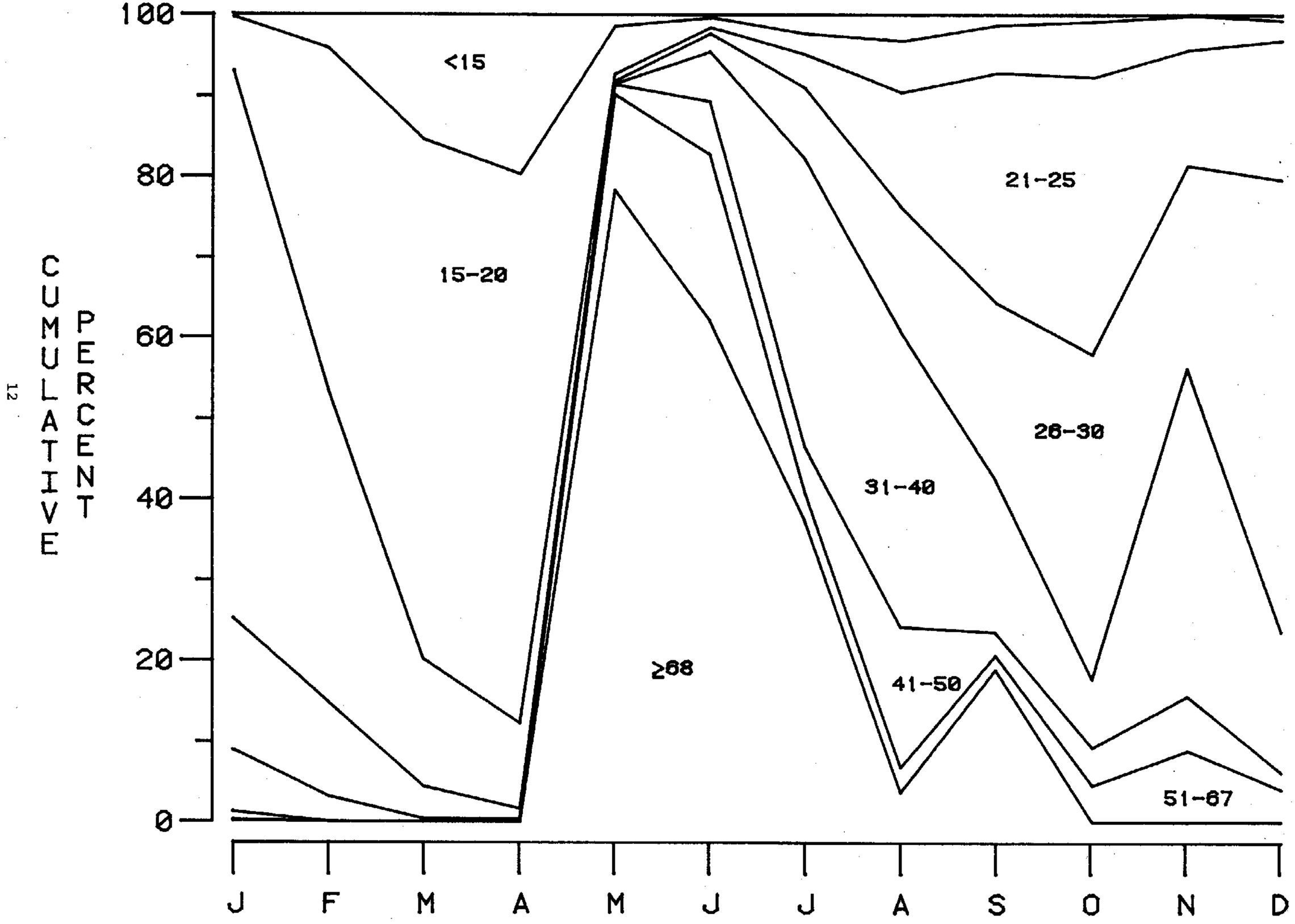
CUMULATIVE PERCENT

100
80
60
40
20
0

<15
15-20
21-25
26-30
31-40
41-50
51-67
≥68

J F M A M J J A S O N D

BROWN SHRIMP
MISSISSIPPI RIVER TO TEXAS
1961



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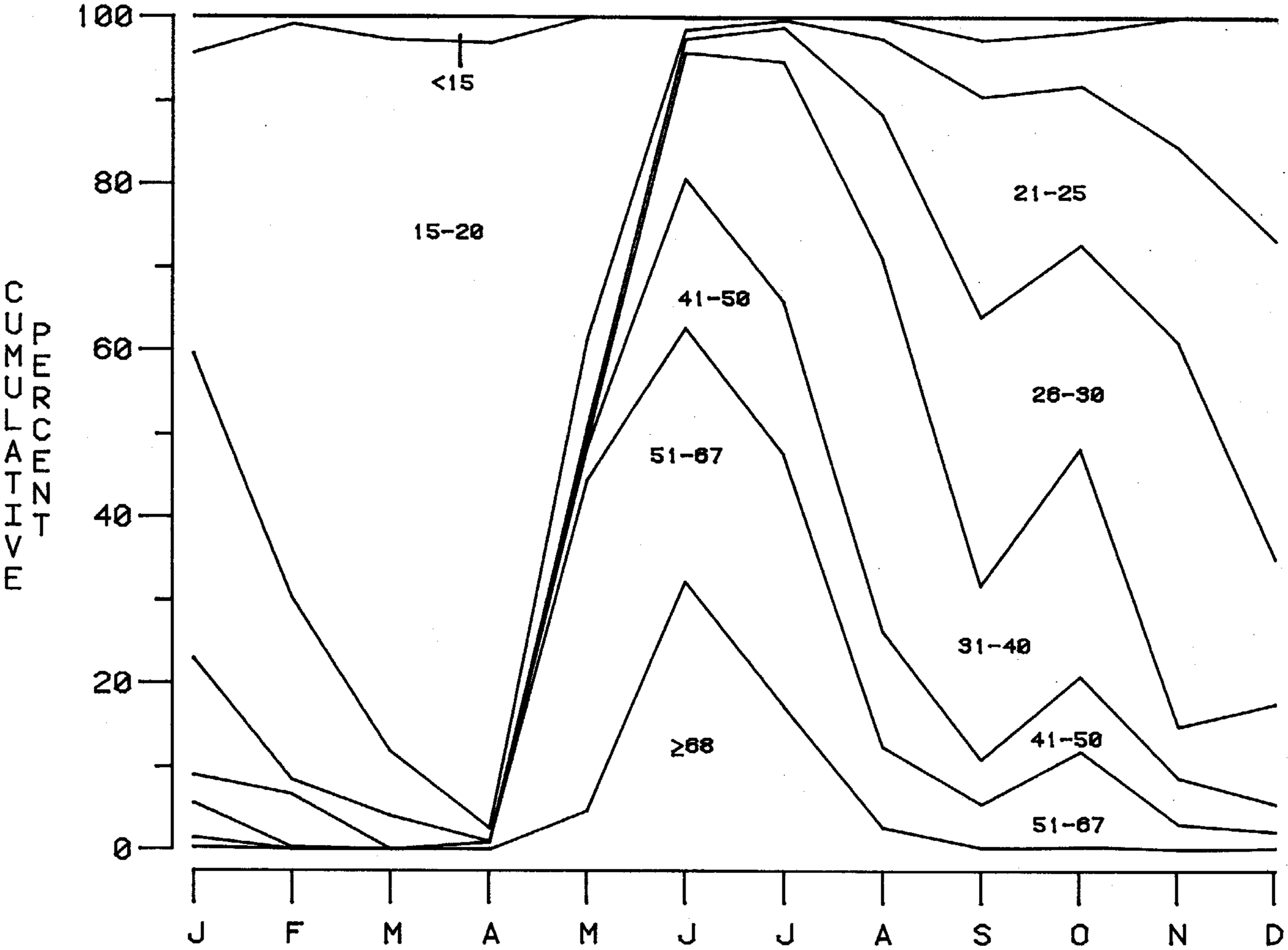


BROWN SHRIMP
TEXAS COAST
1962

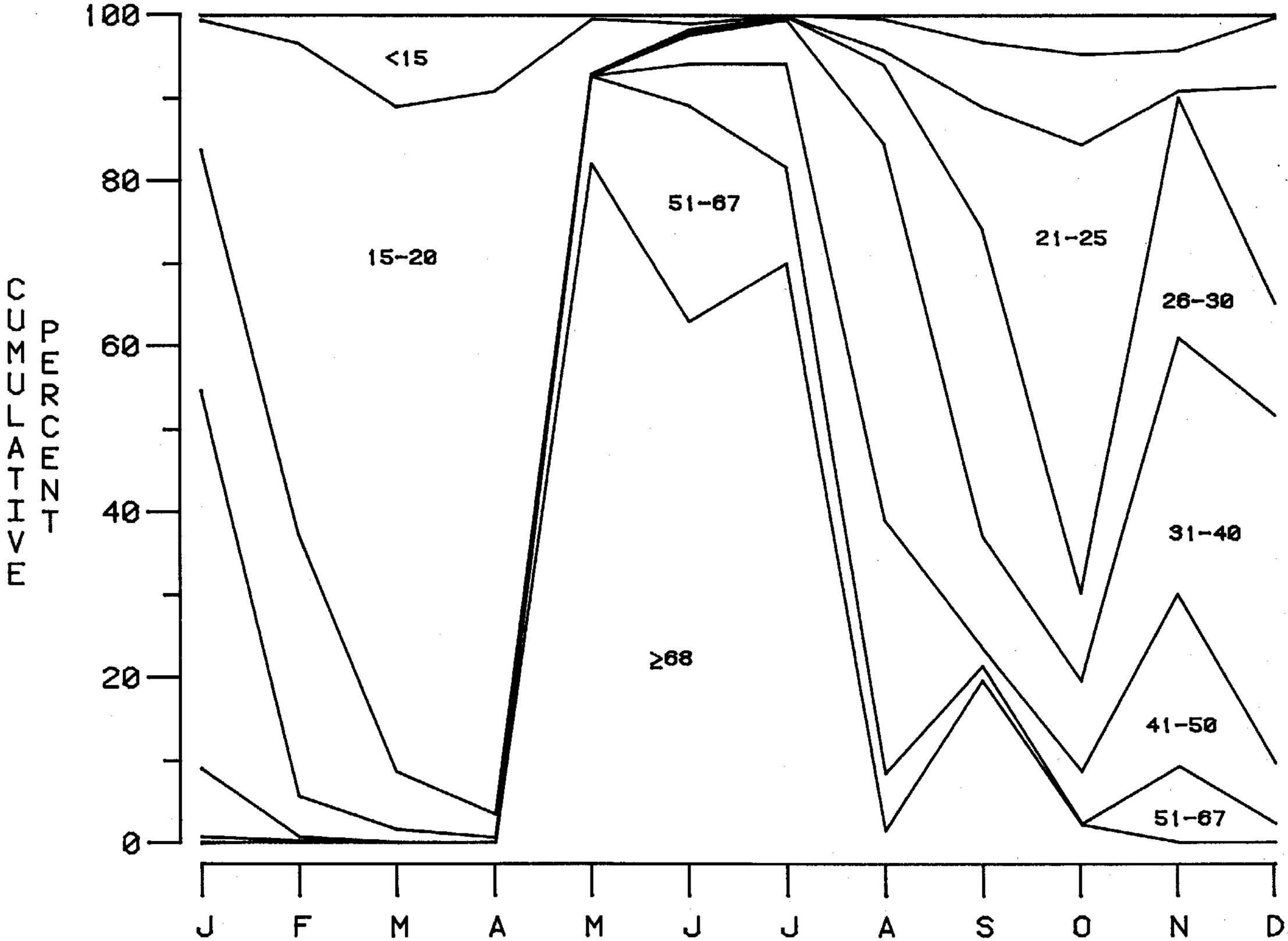
CUMULATIVE PERCENT

100
80
60
40
20
0

<15
15-20
31-40
21-25
41-50
26-30
51-67
≥68

J F M A M J J A S O N D

BROWN SHRIMP
MISSISSIPPI RIVER TO TEXAS
1962



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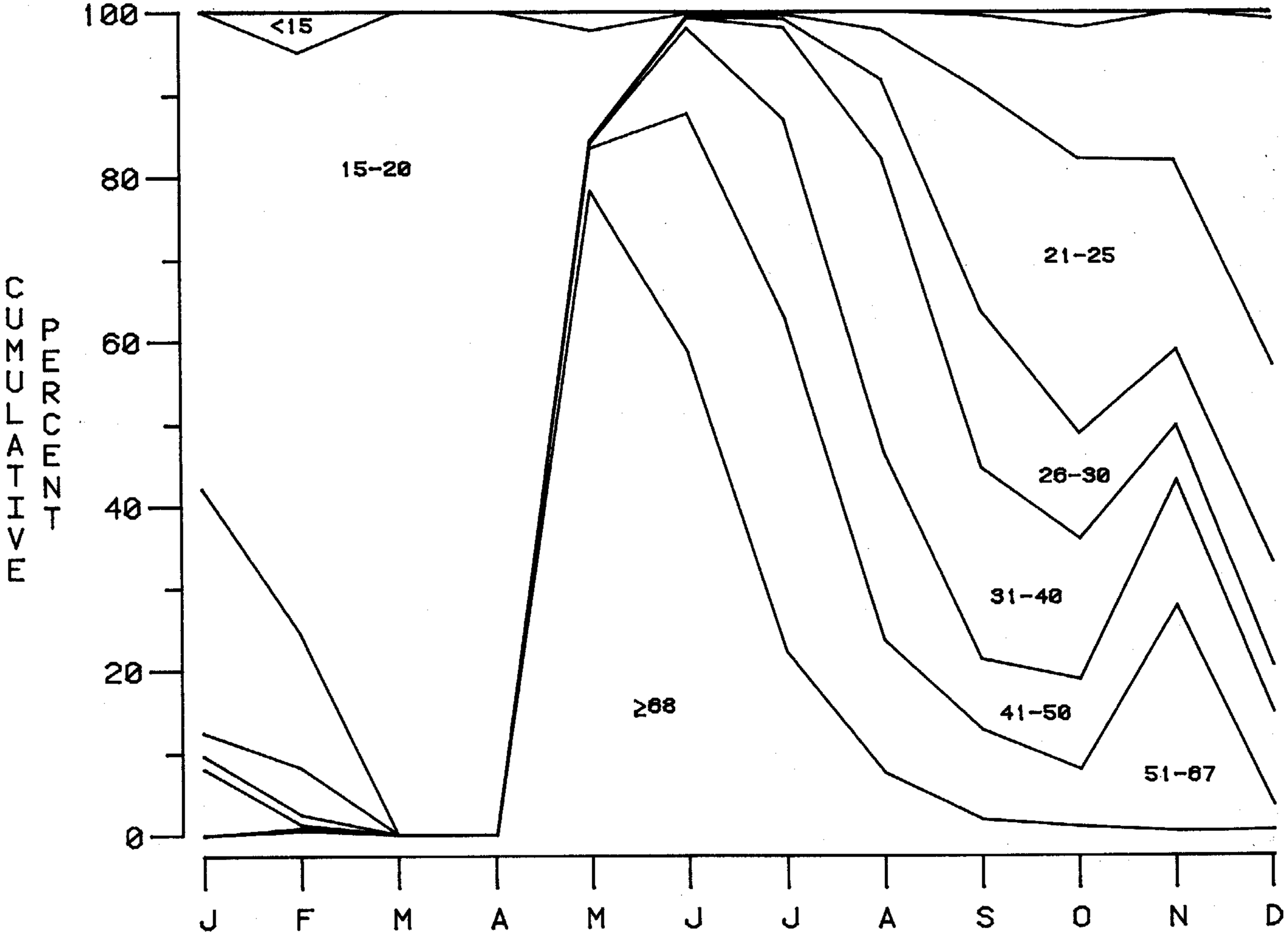
1962



BROWN SHRIMP
TEXAS COAST
1963

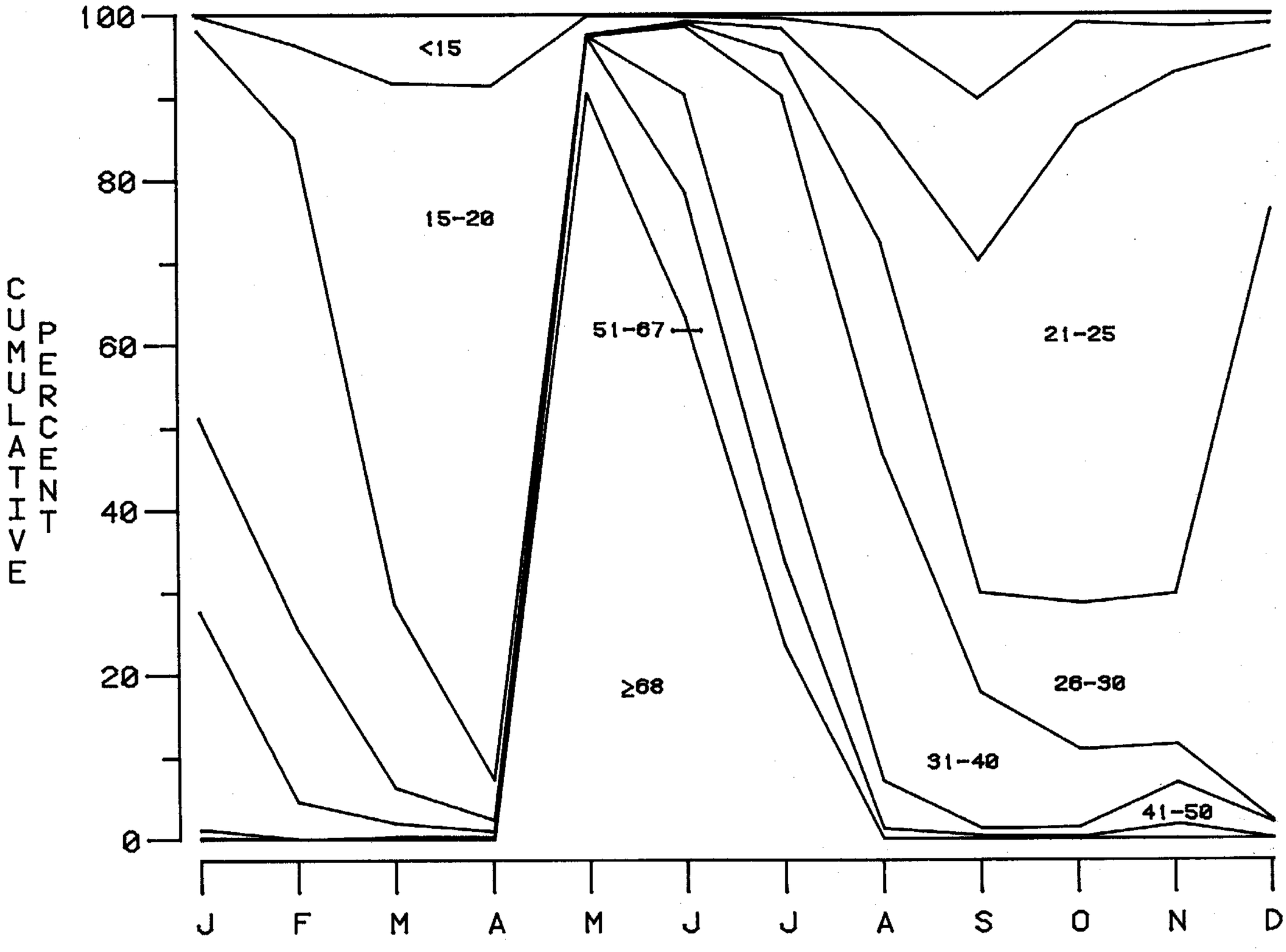
CUMULATIVE PERCENT

100
80
60
40
20
0

<15
15-20
21-25
26-30
31-40
41-50
51-67
≥68

J F M A M J J A S O N D

BROWN SHRIMP
MISSISSIPPI RIVER TO TEXAS
1963



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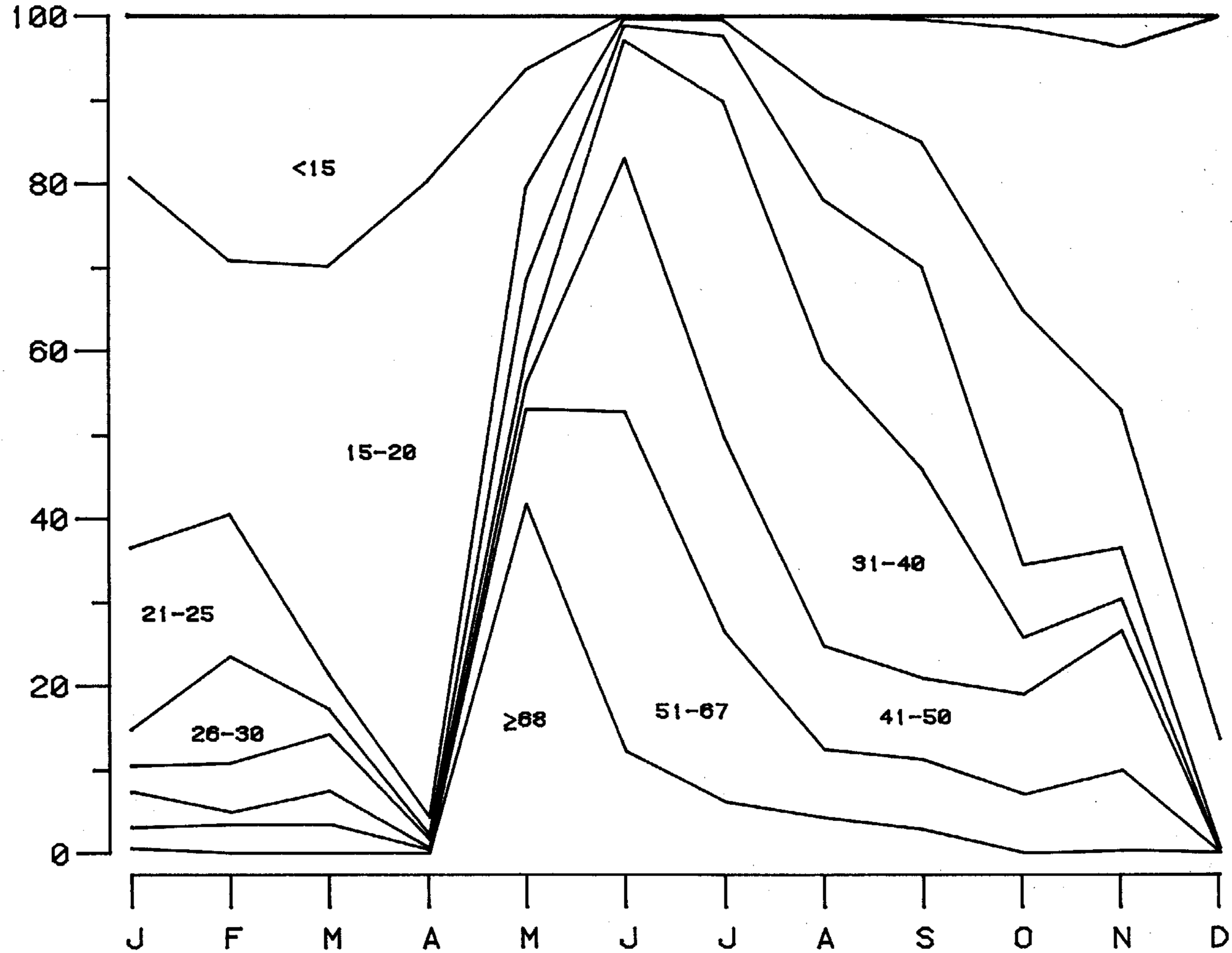

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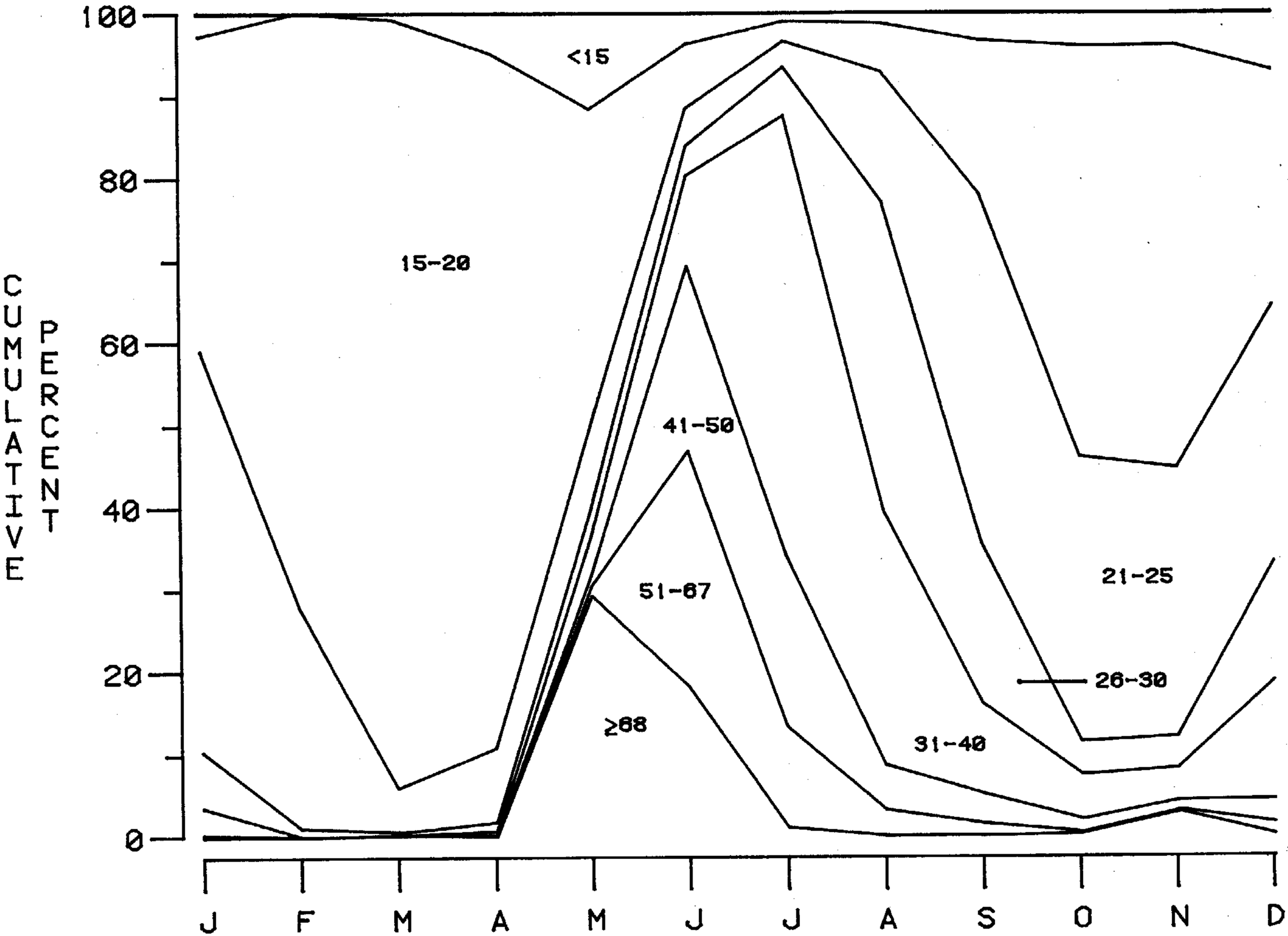
TEXAS COAST
1964



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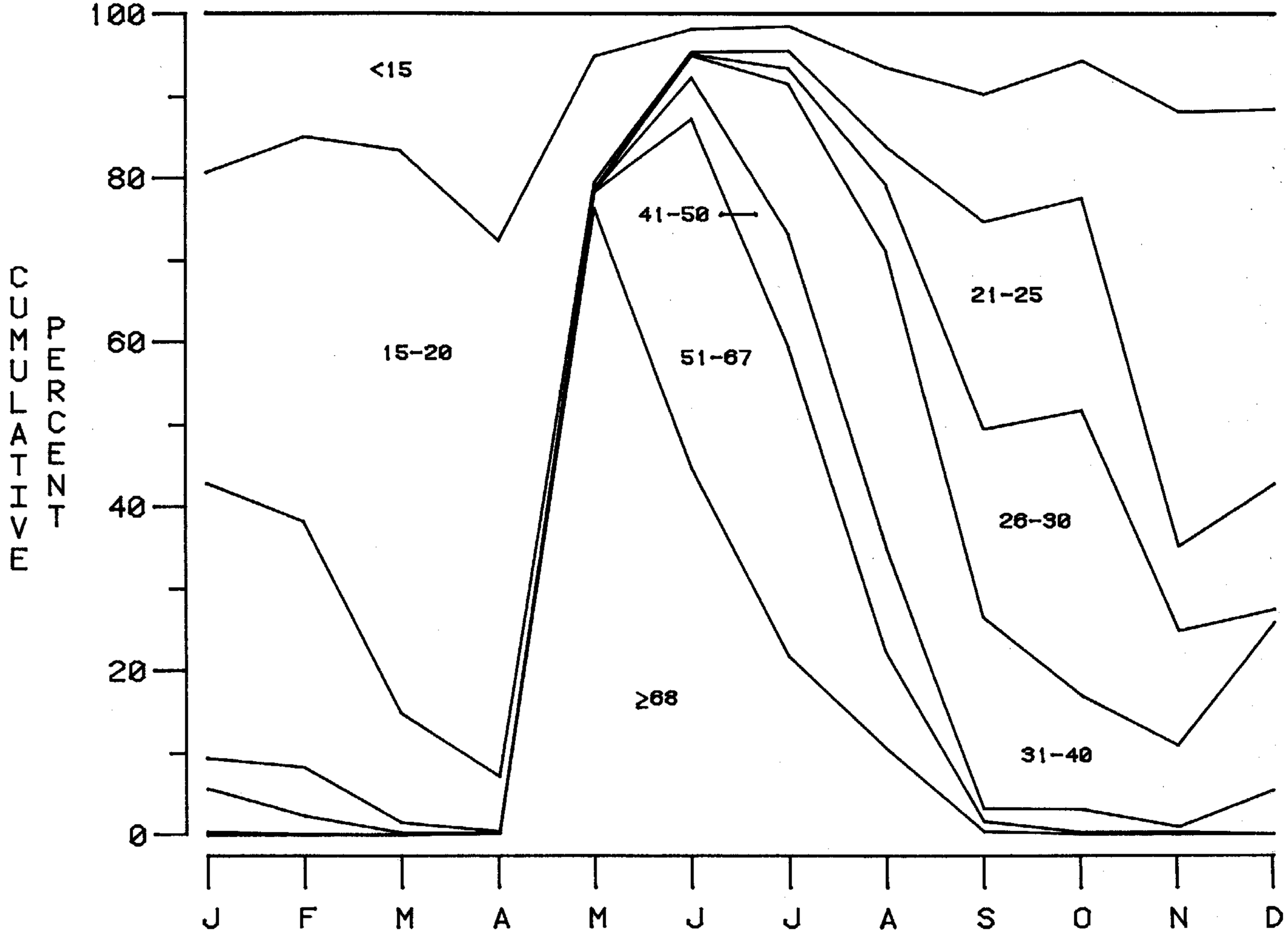

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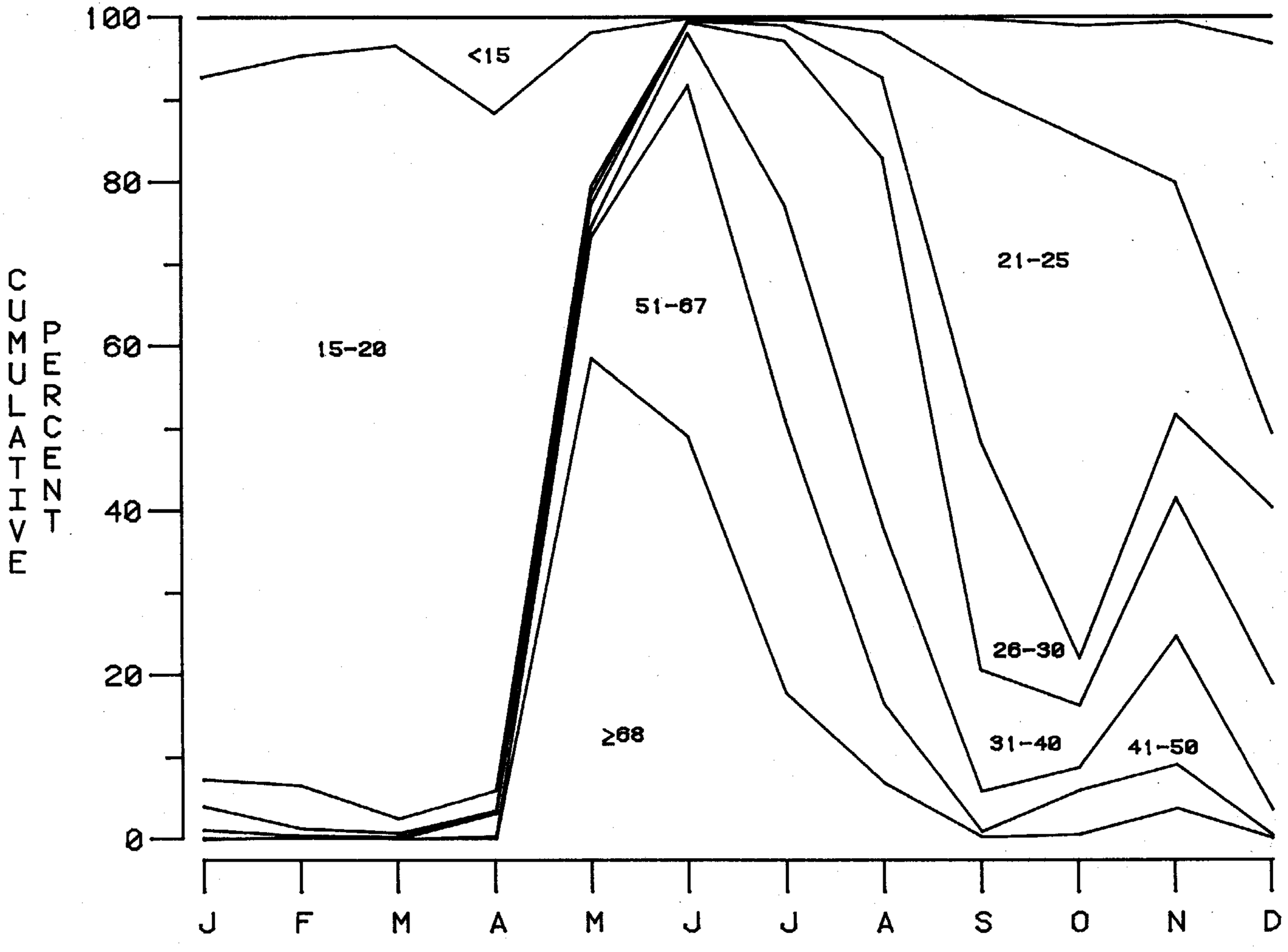

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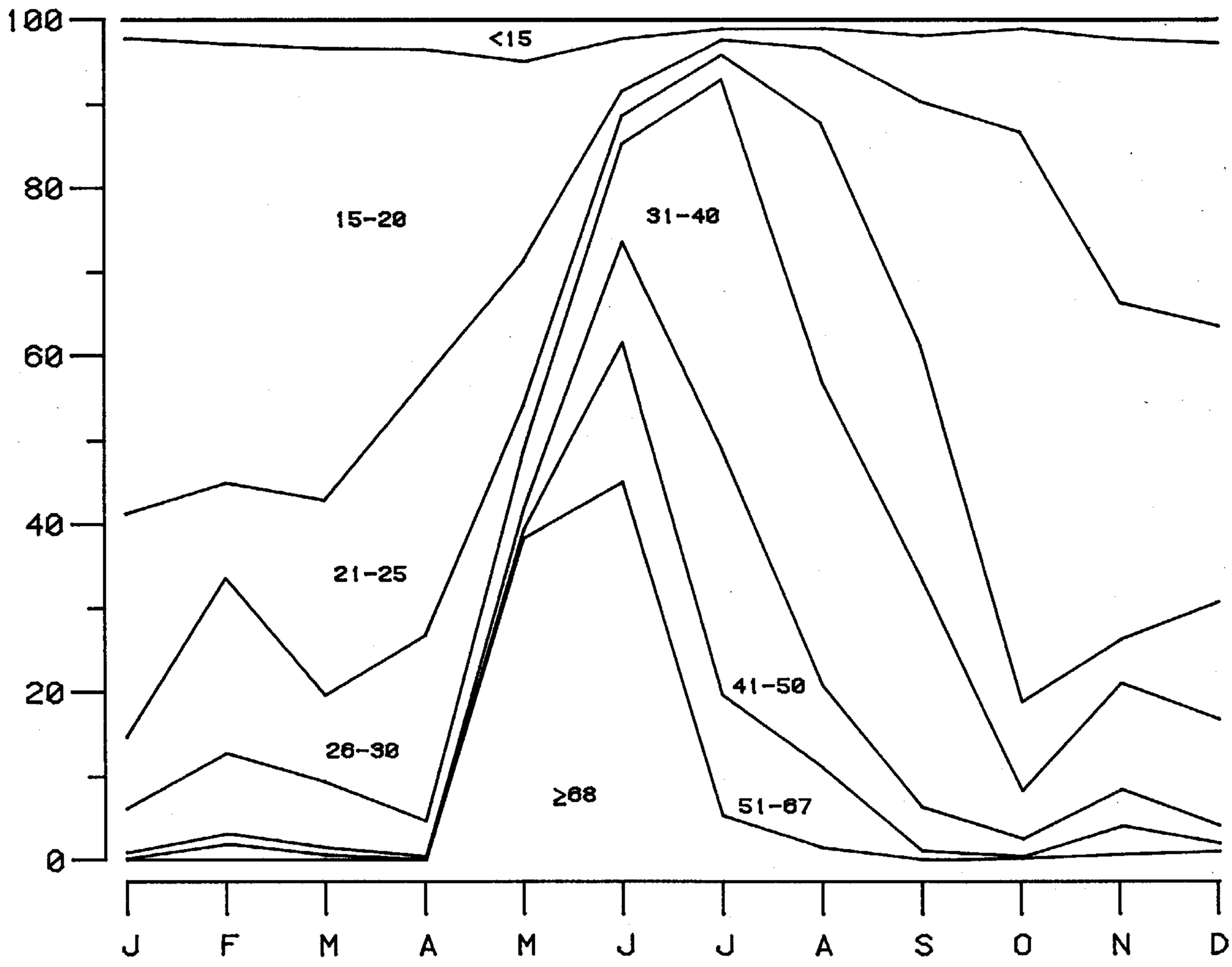

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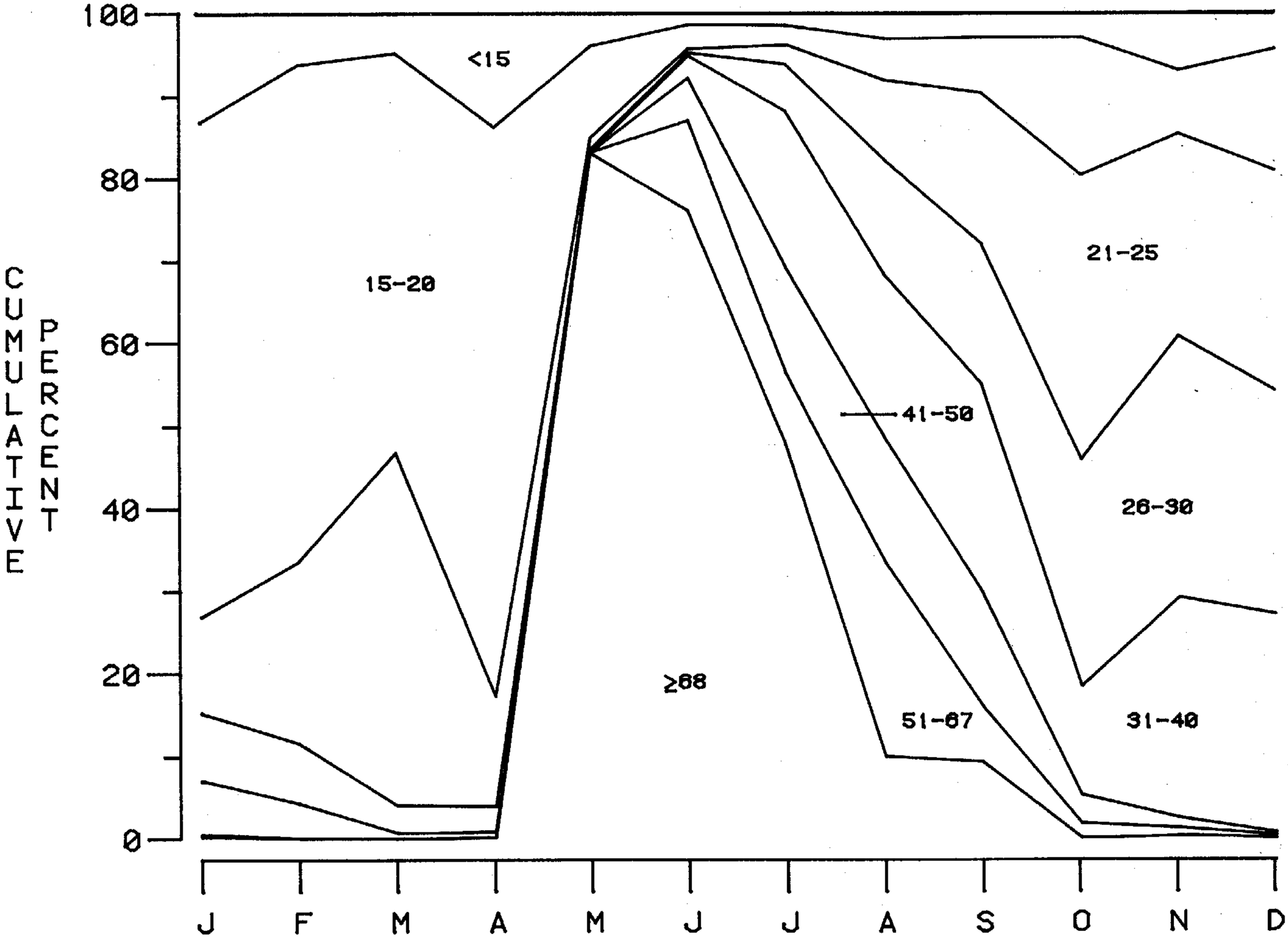

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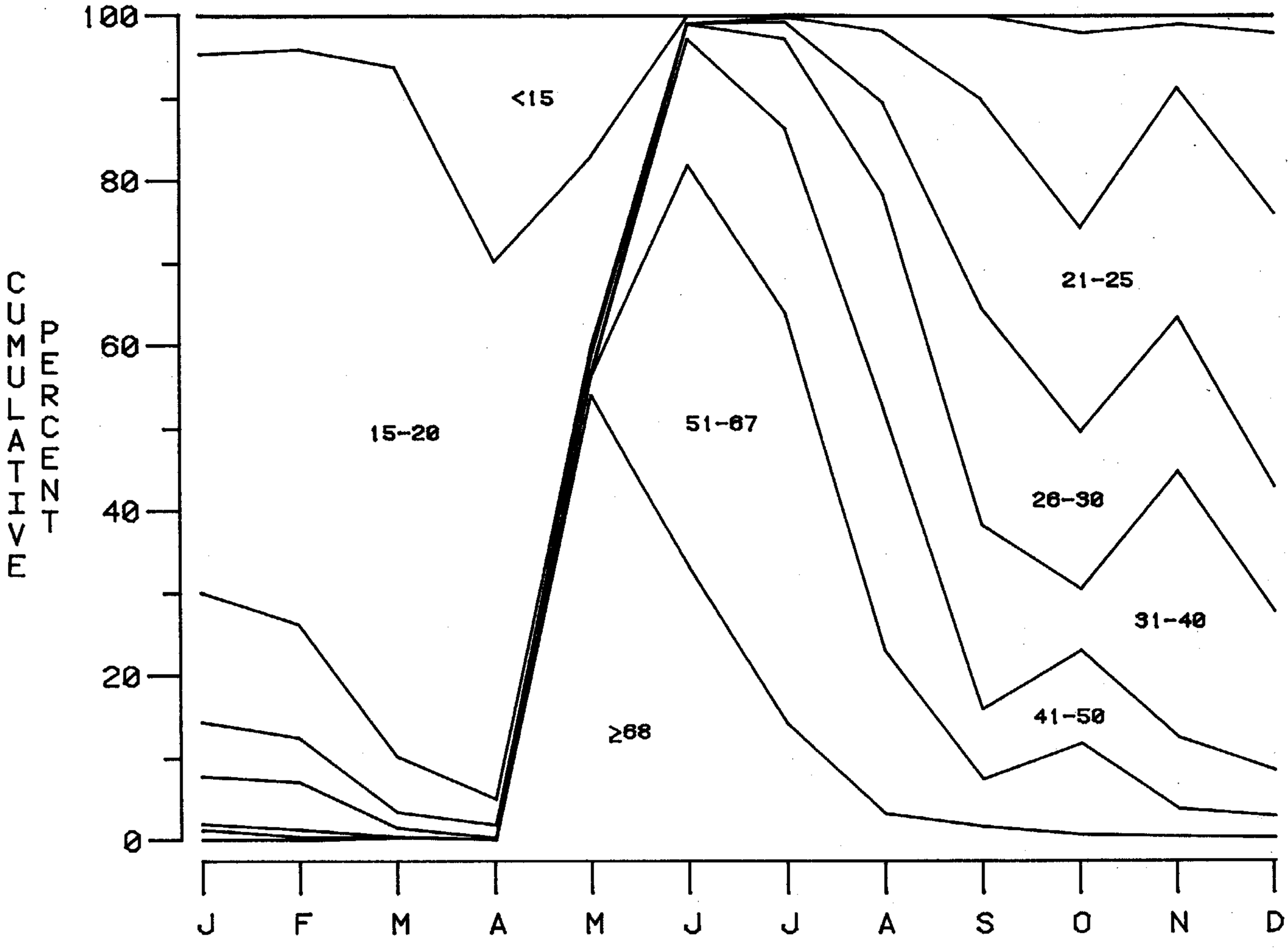

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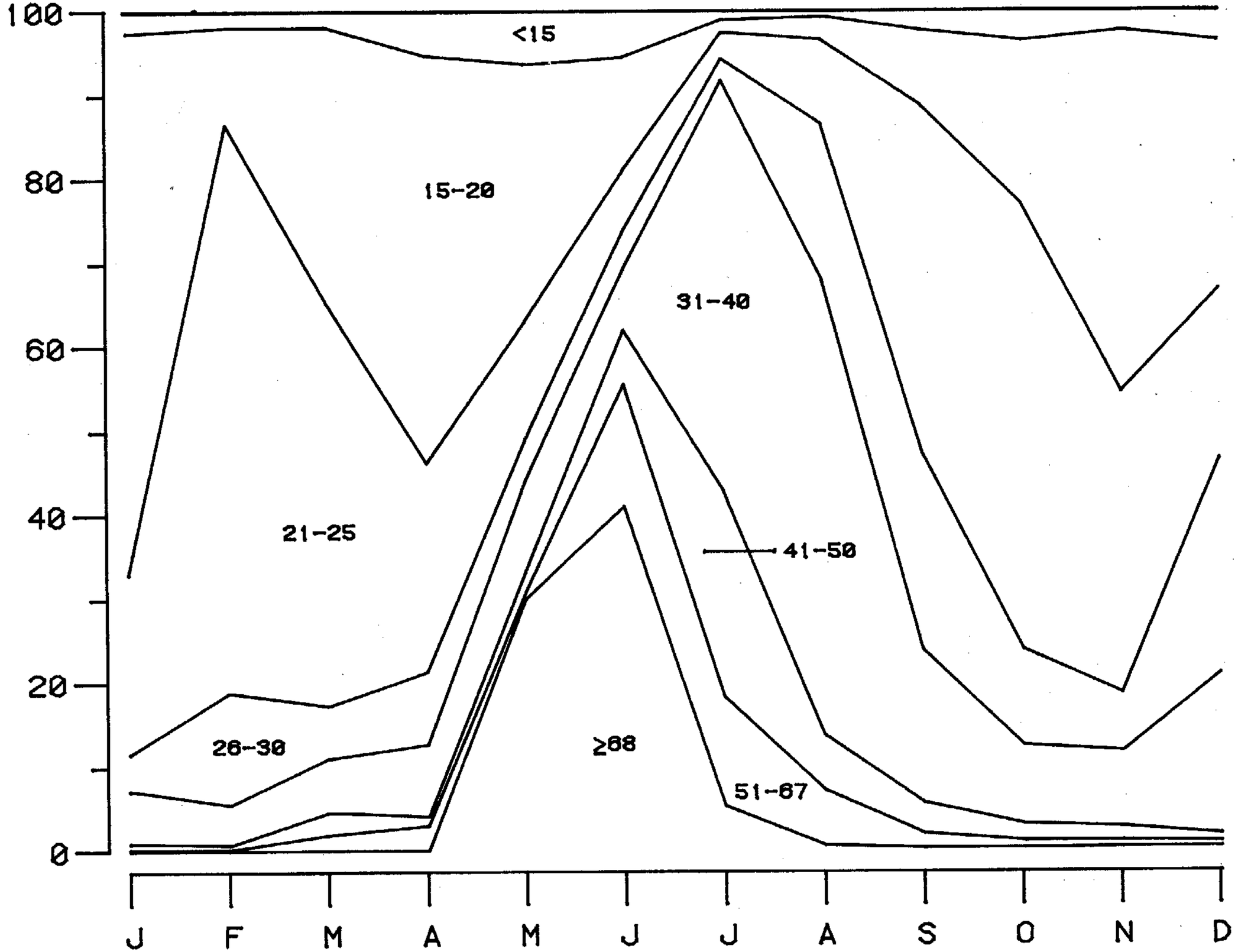

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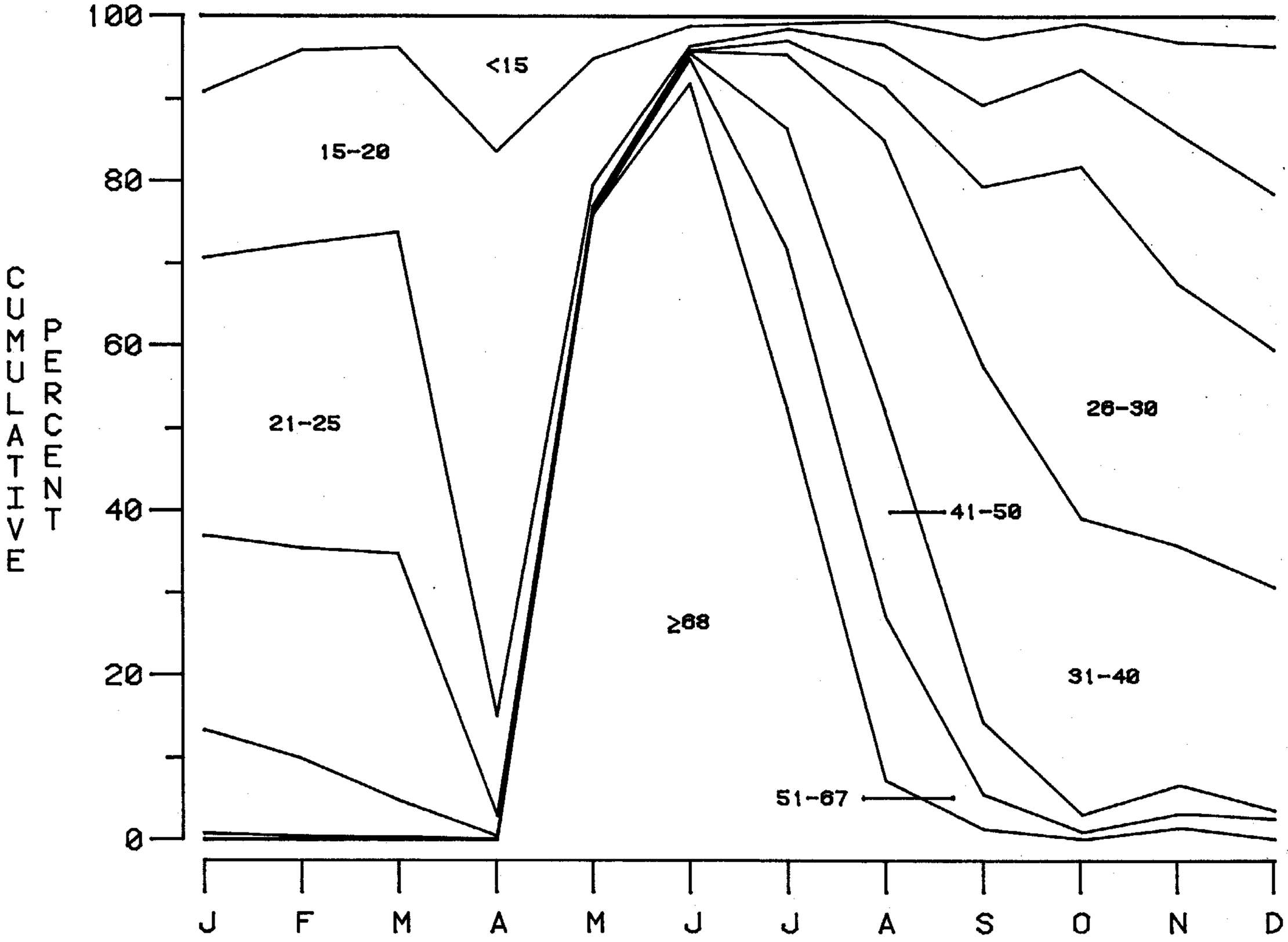

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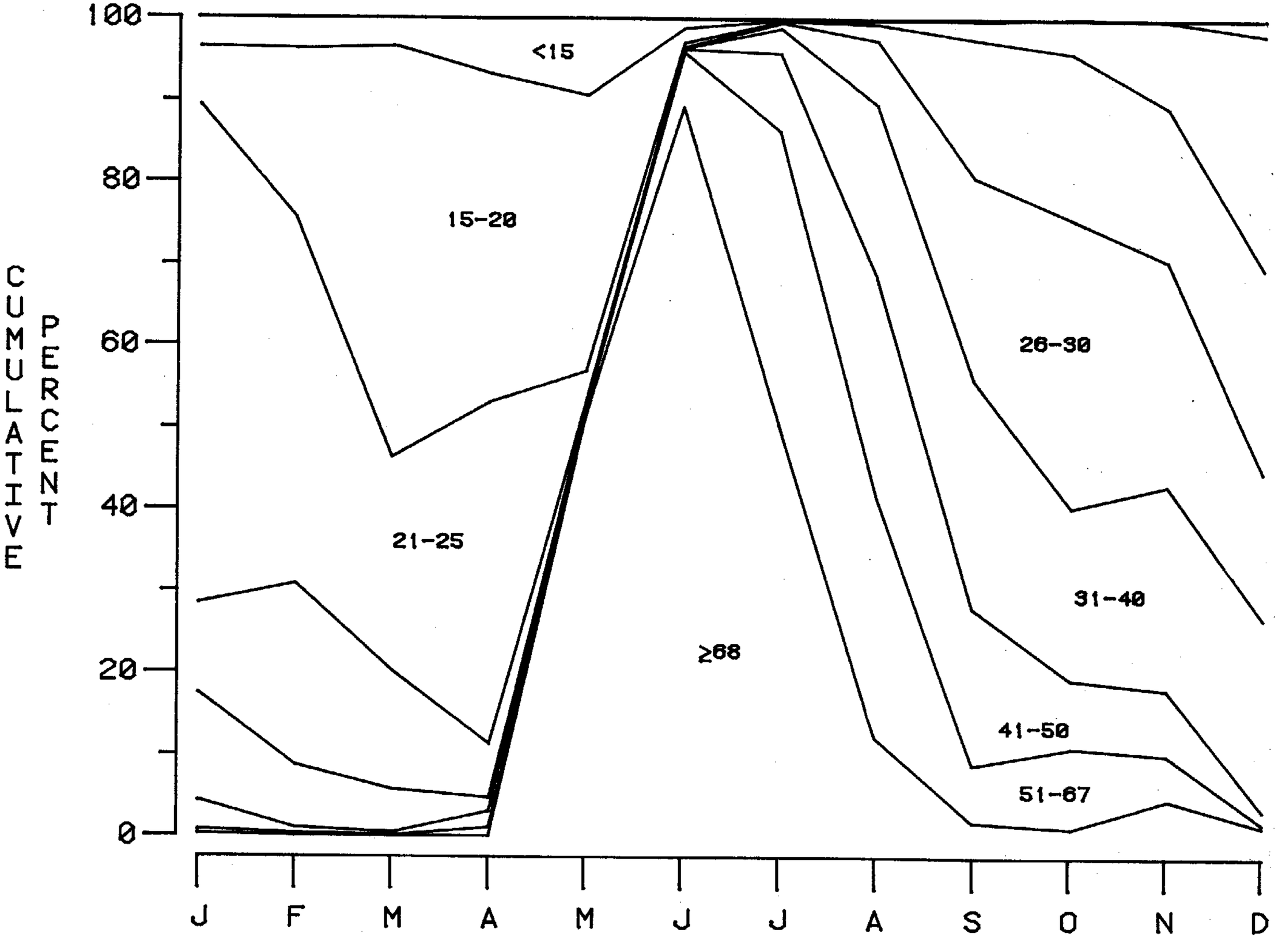

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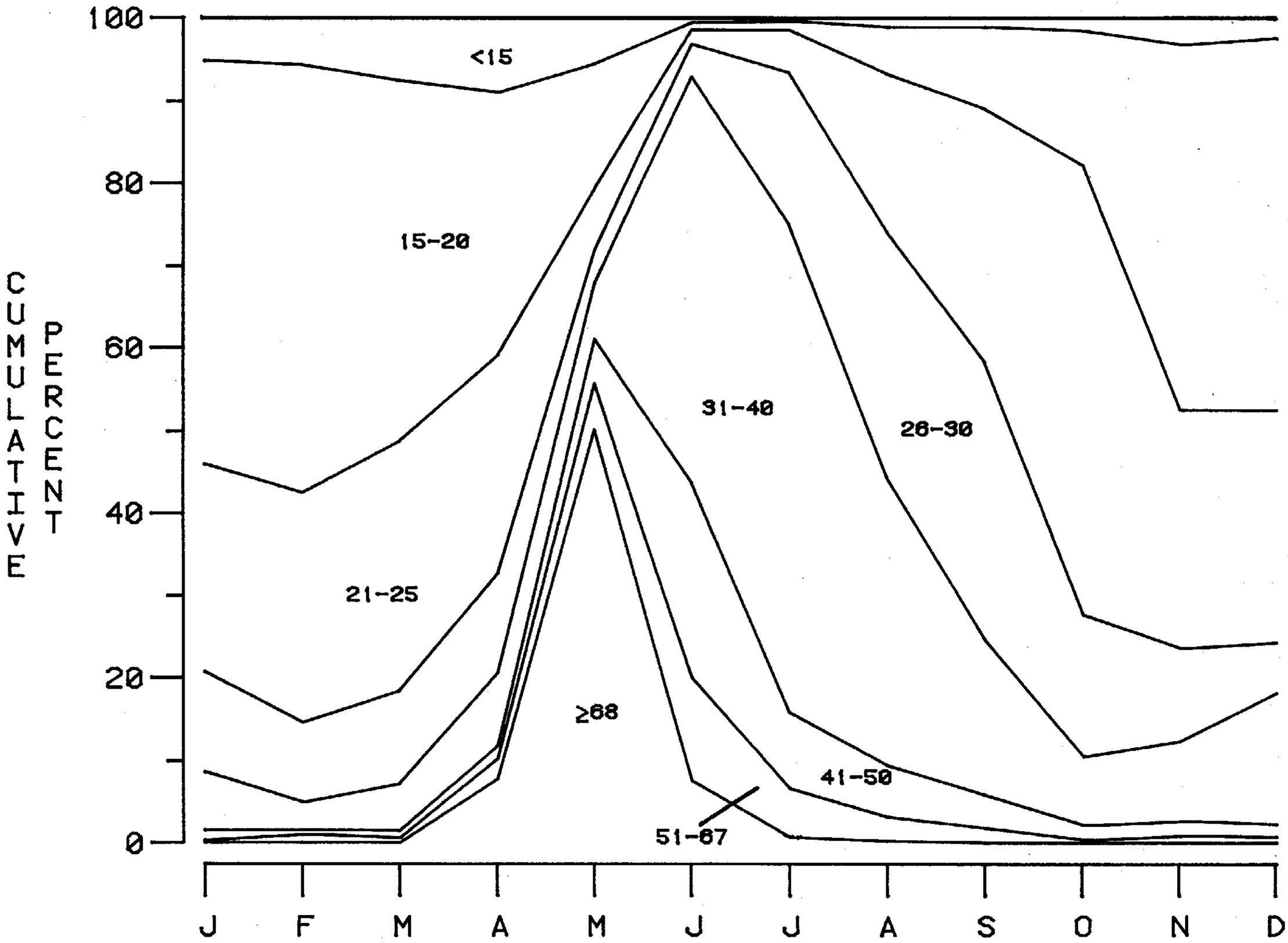

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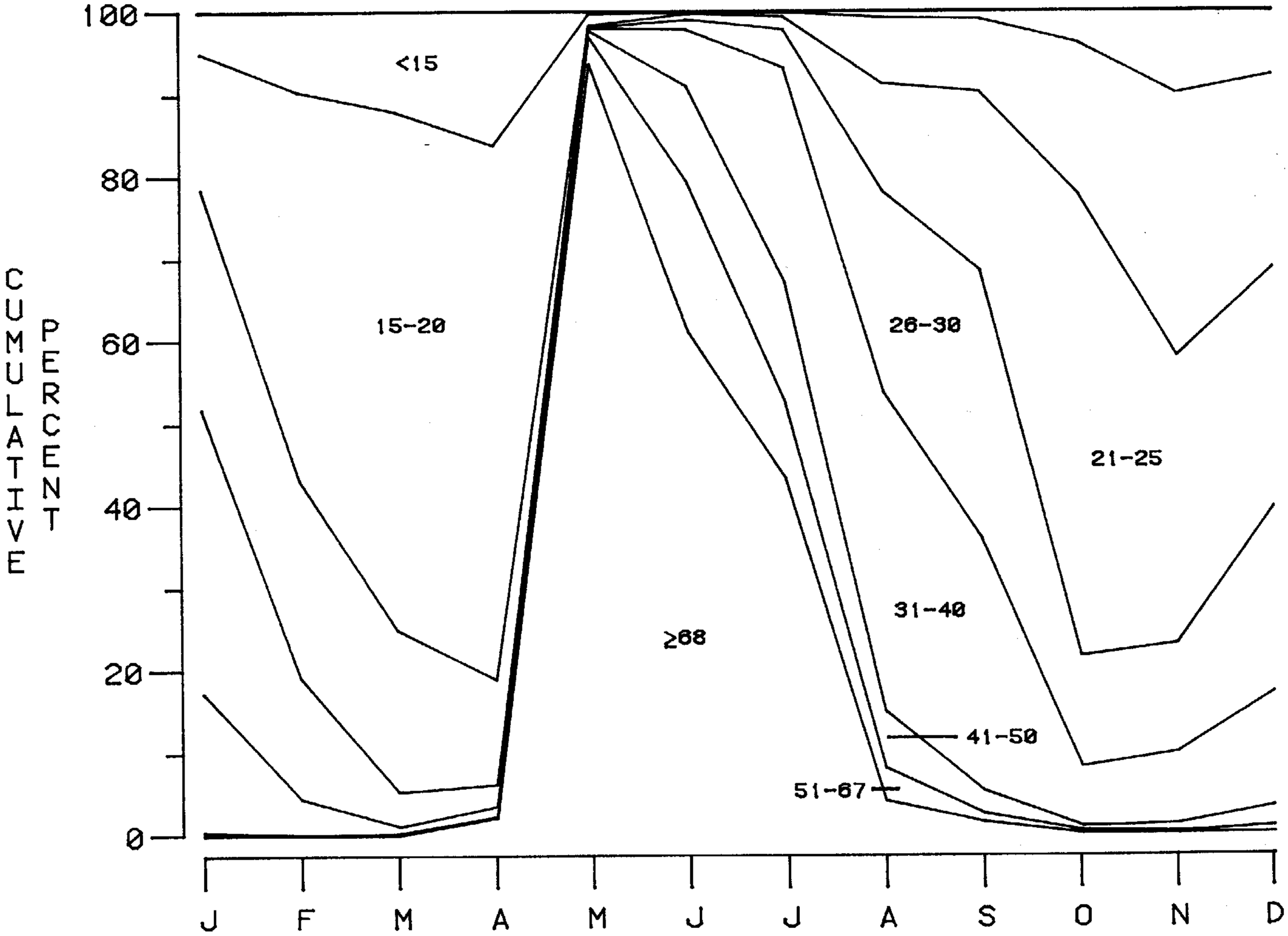

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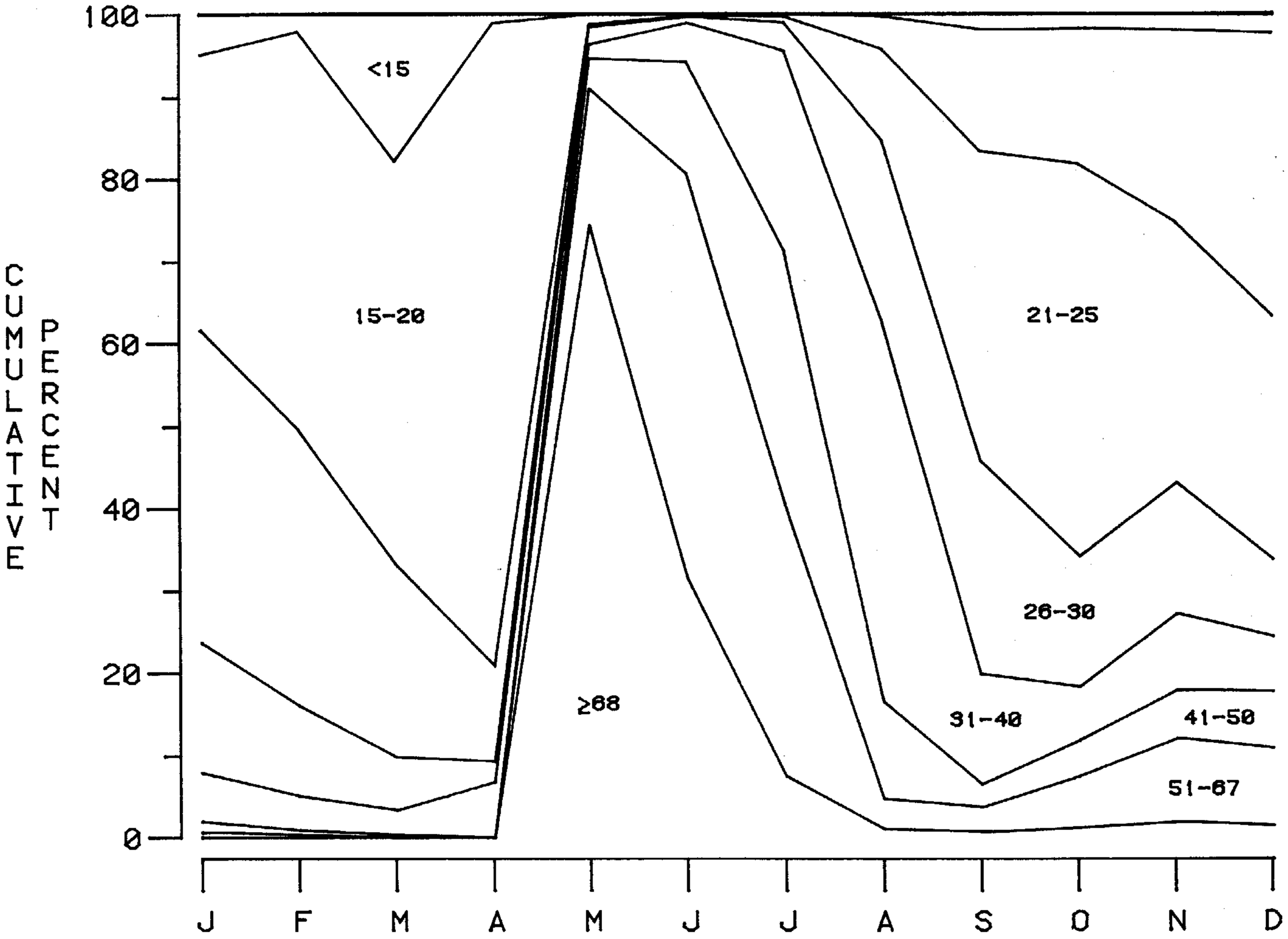

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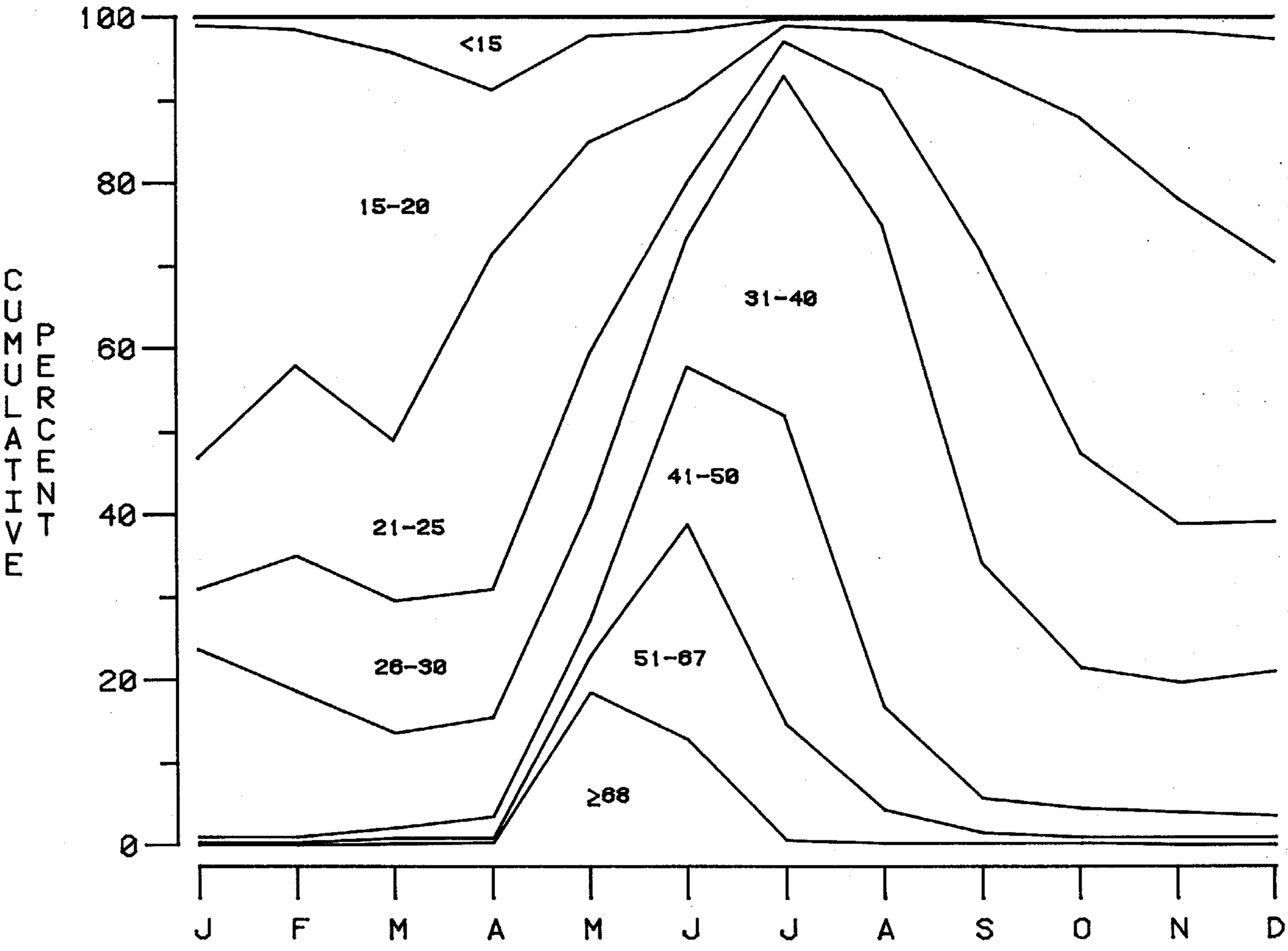

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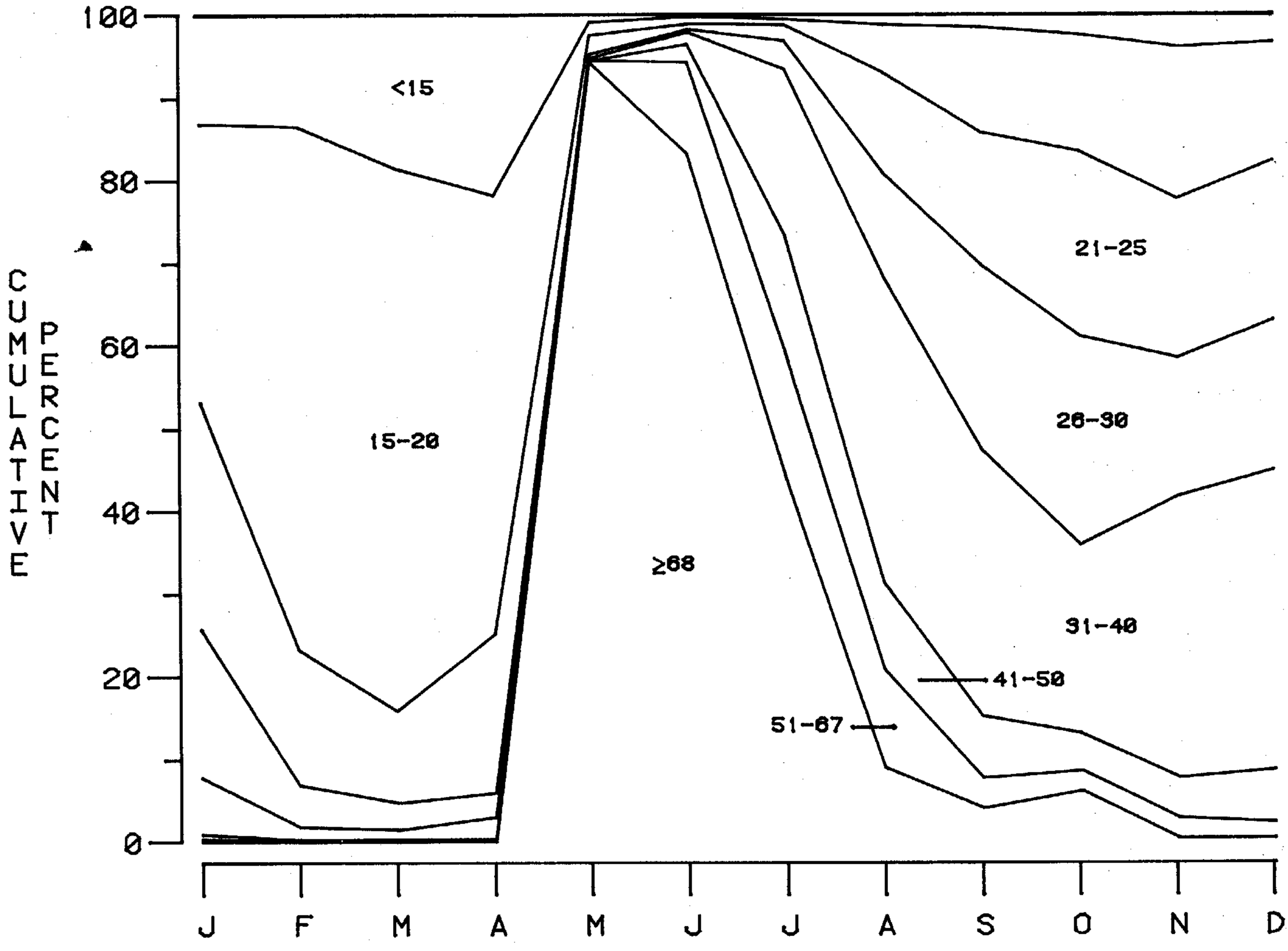

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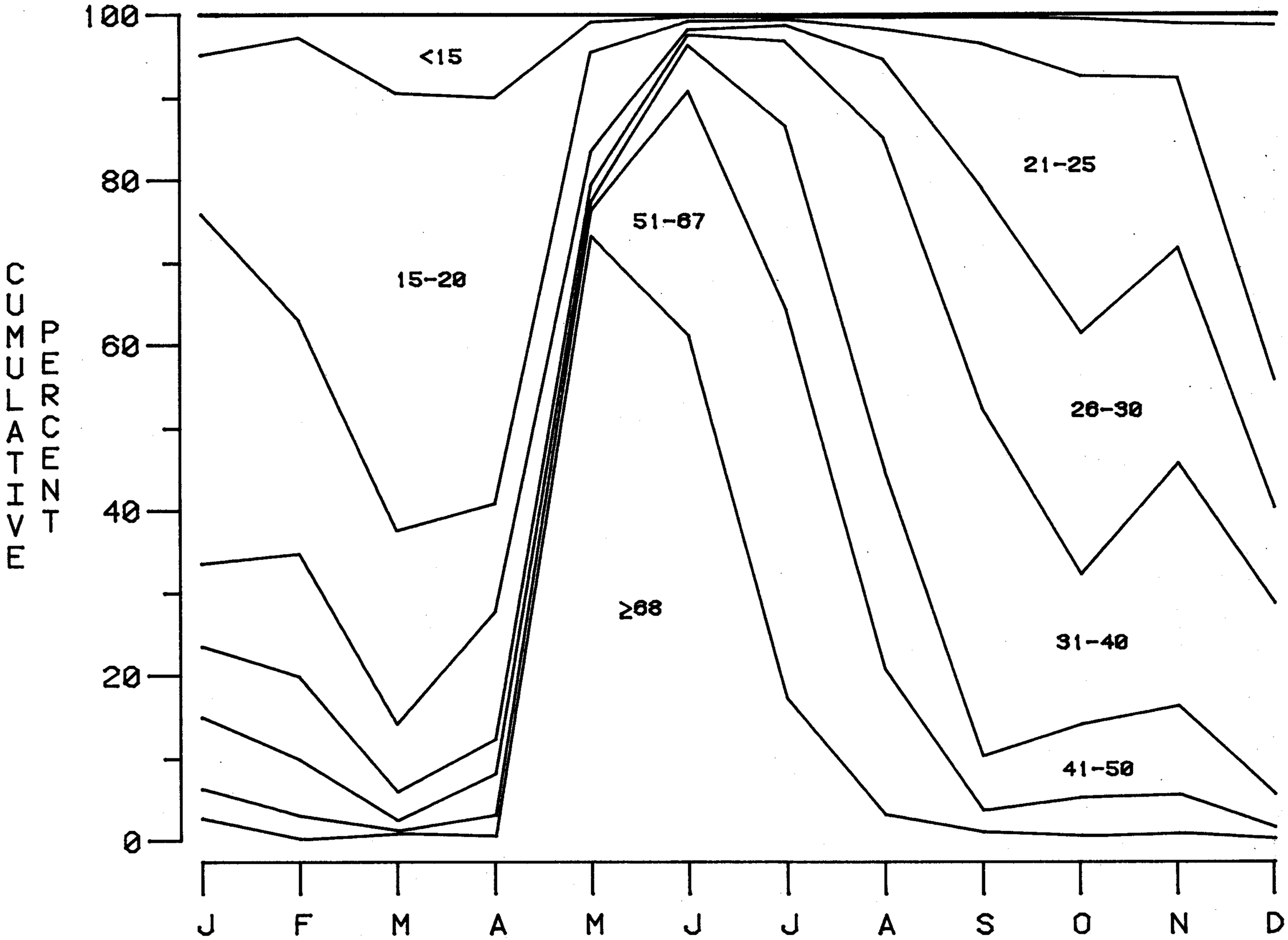

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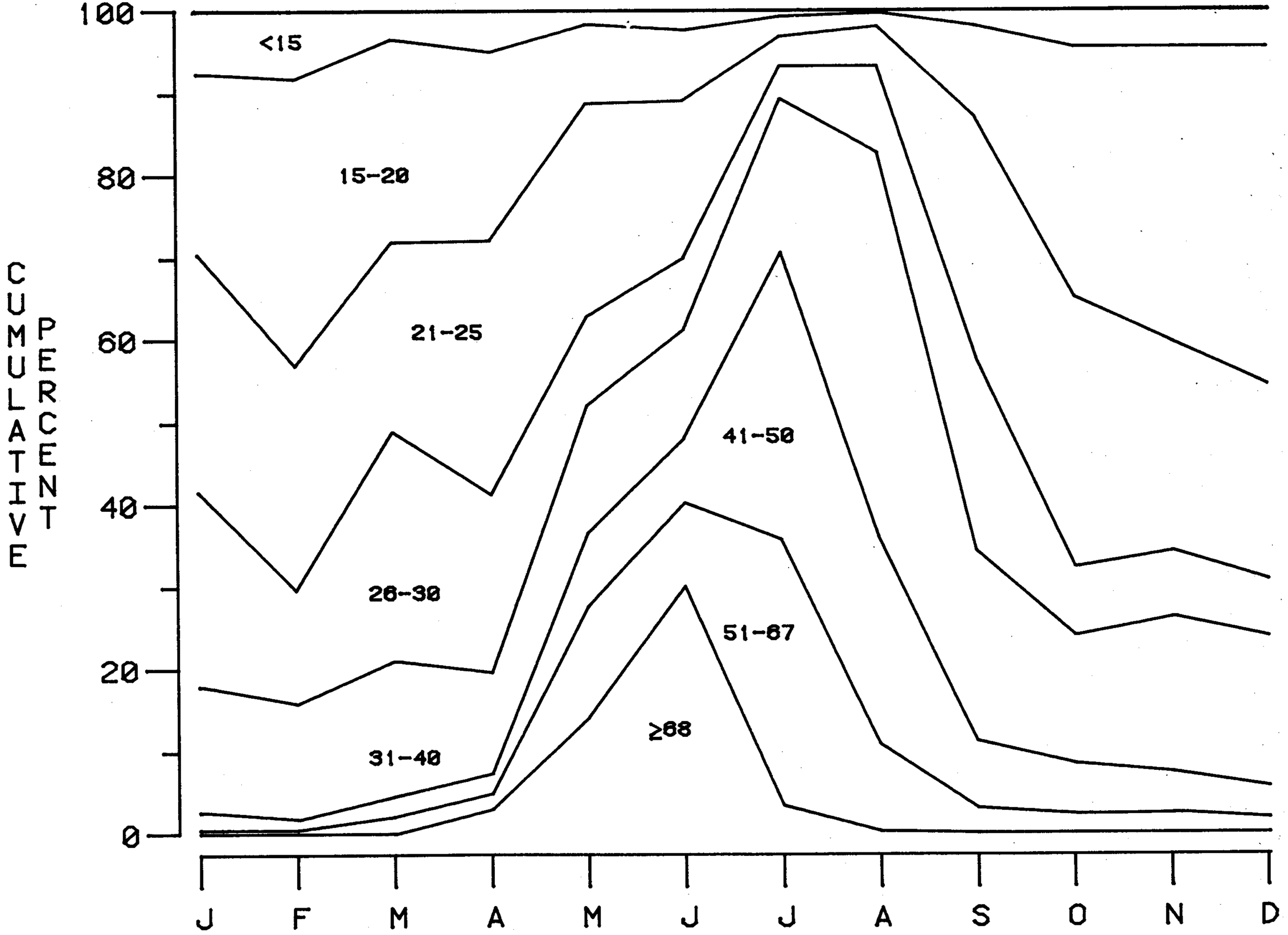

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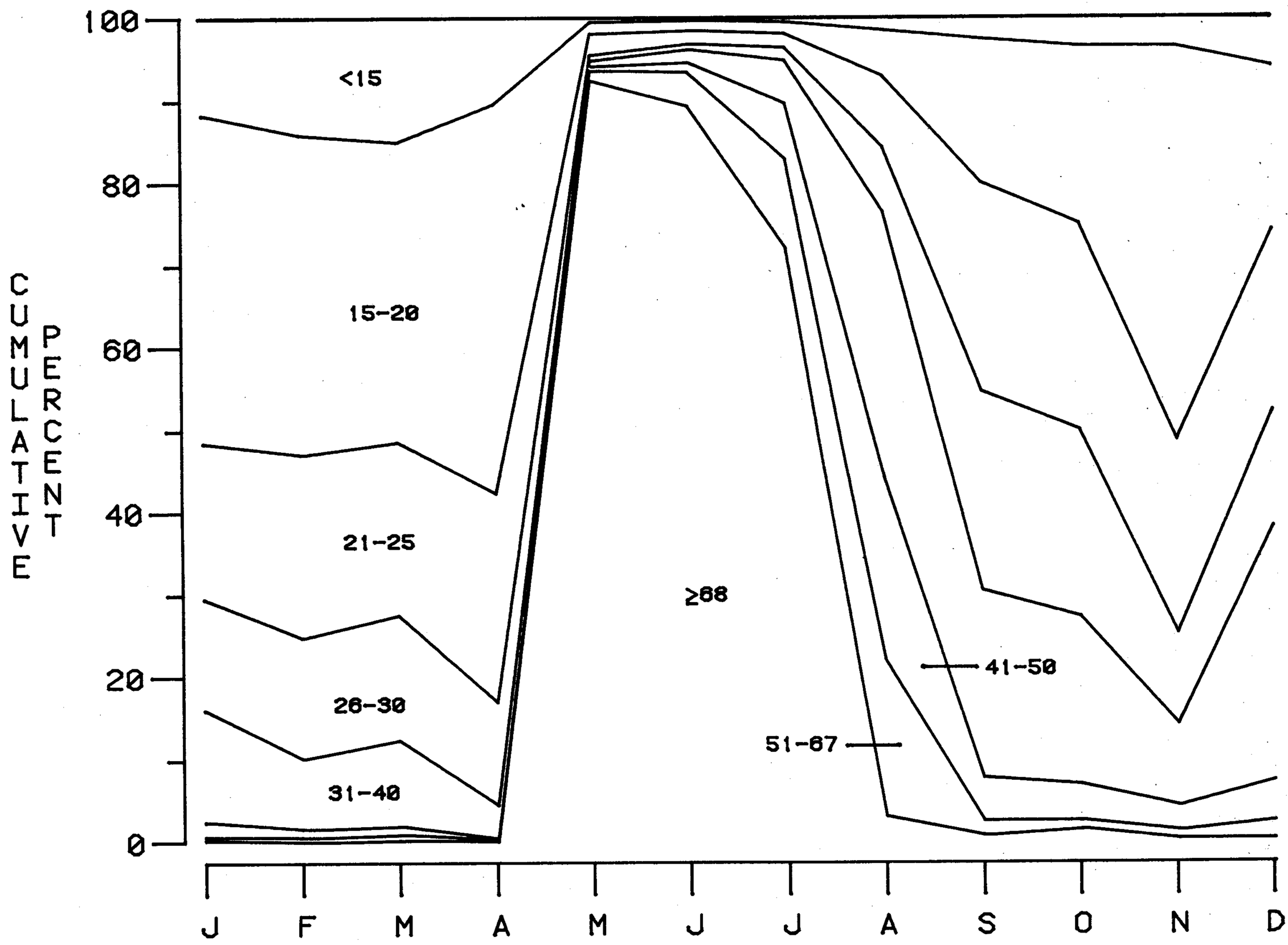

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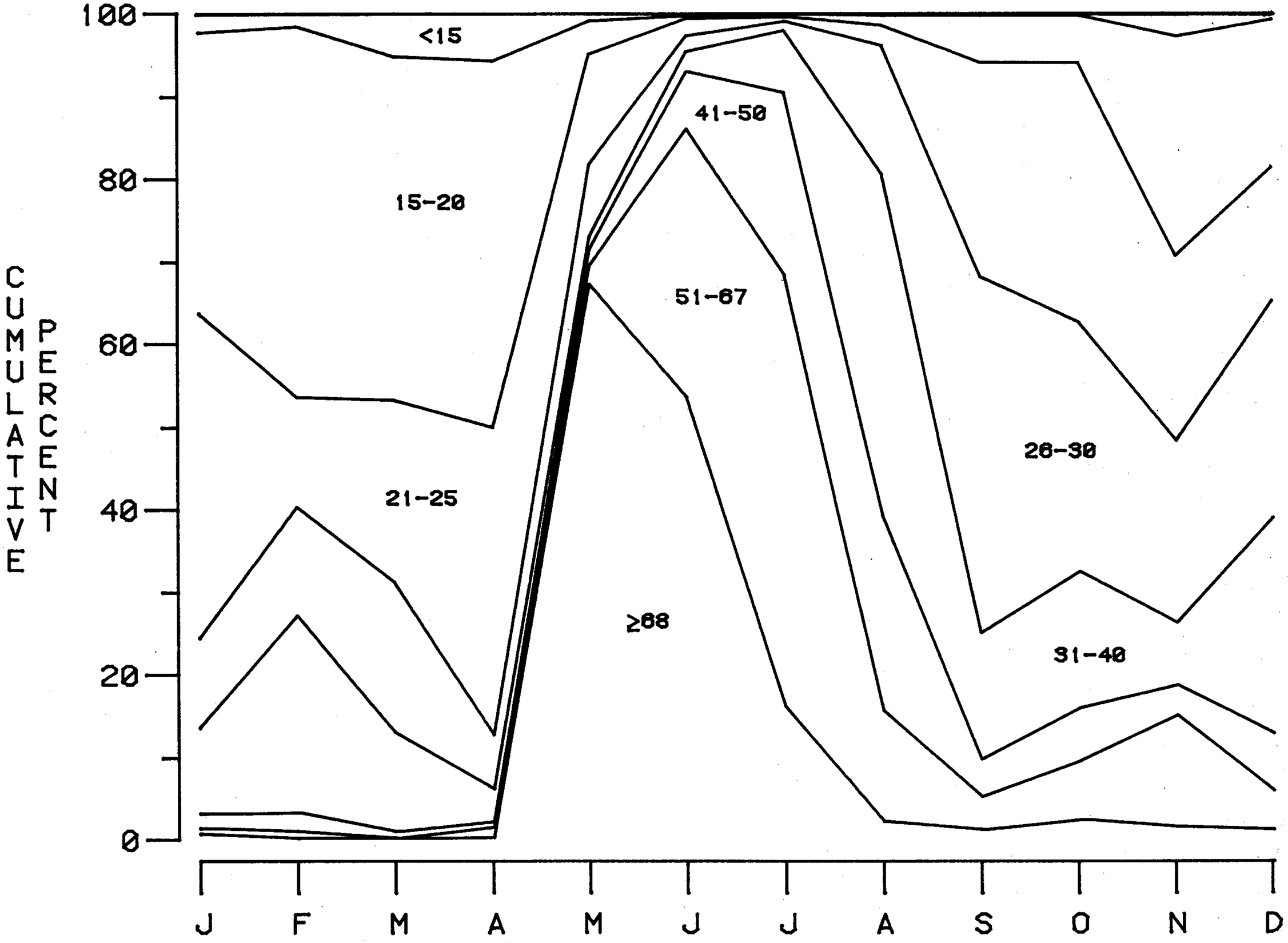

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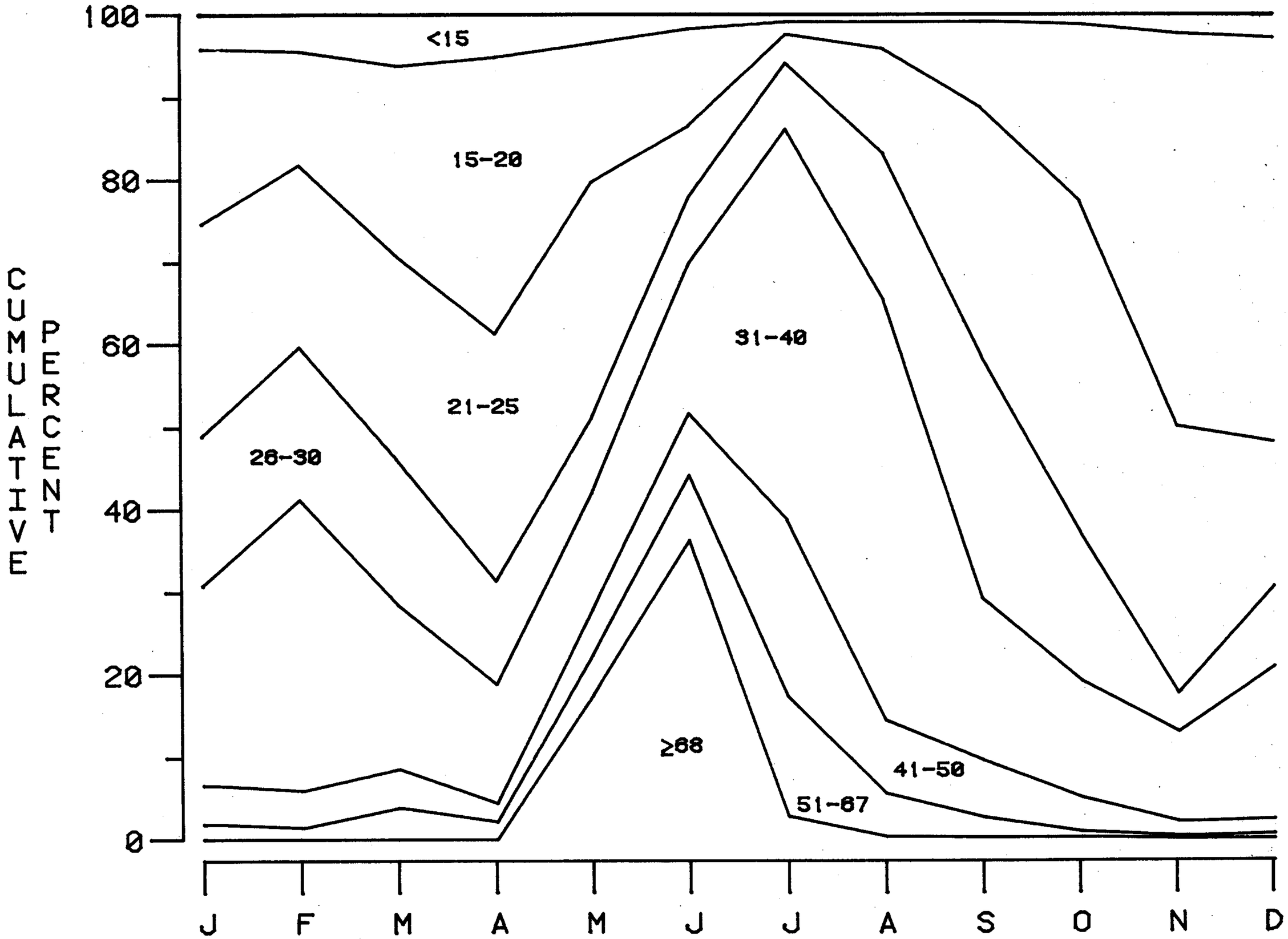

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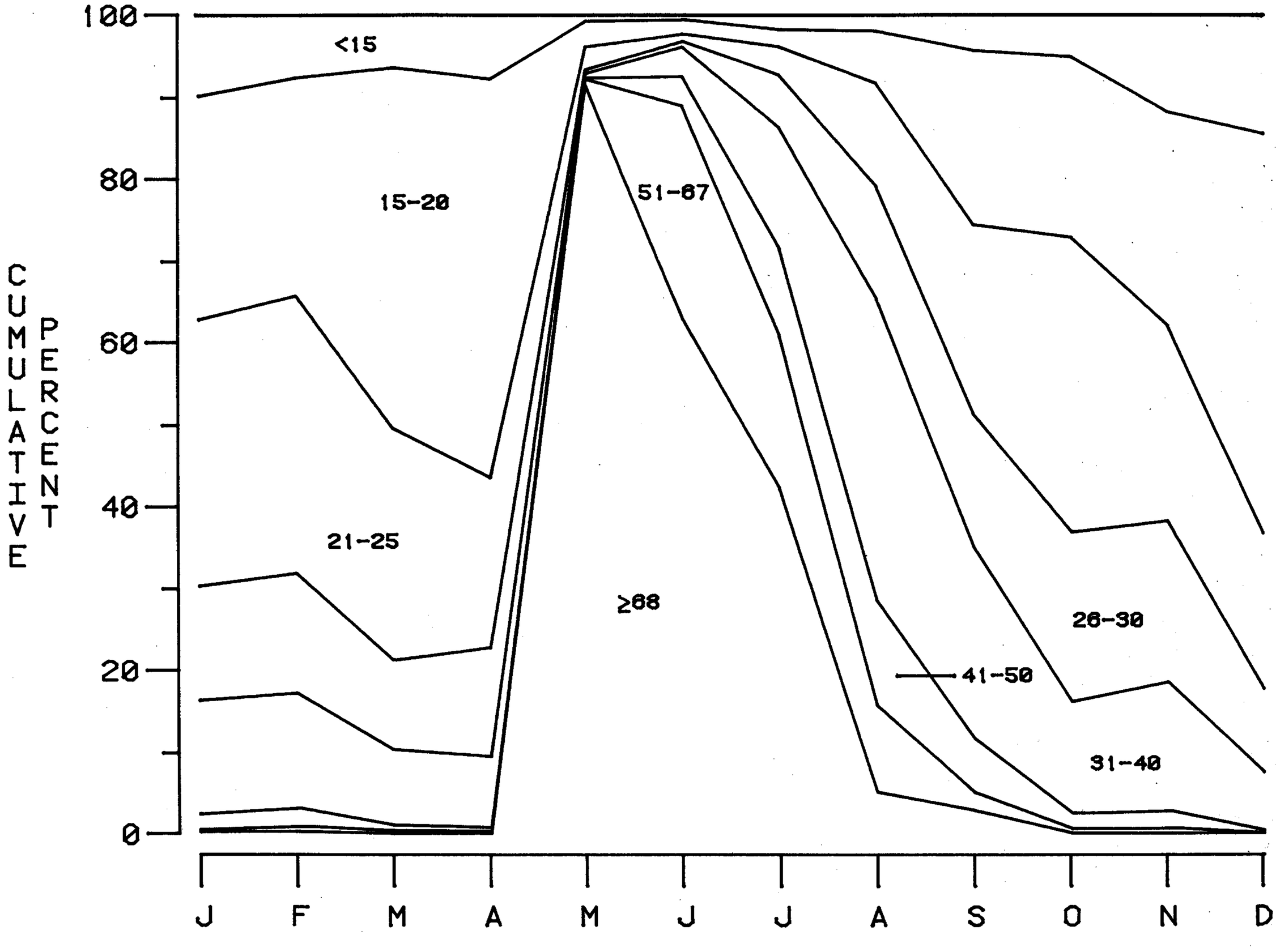

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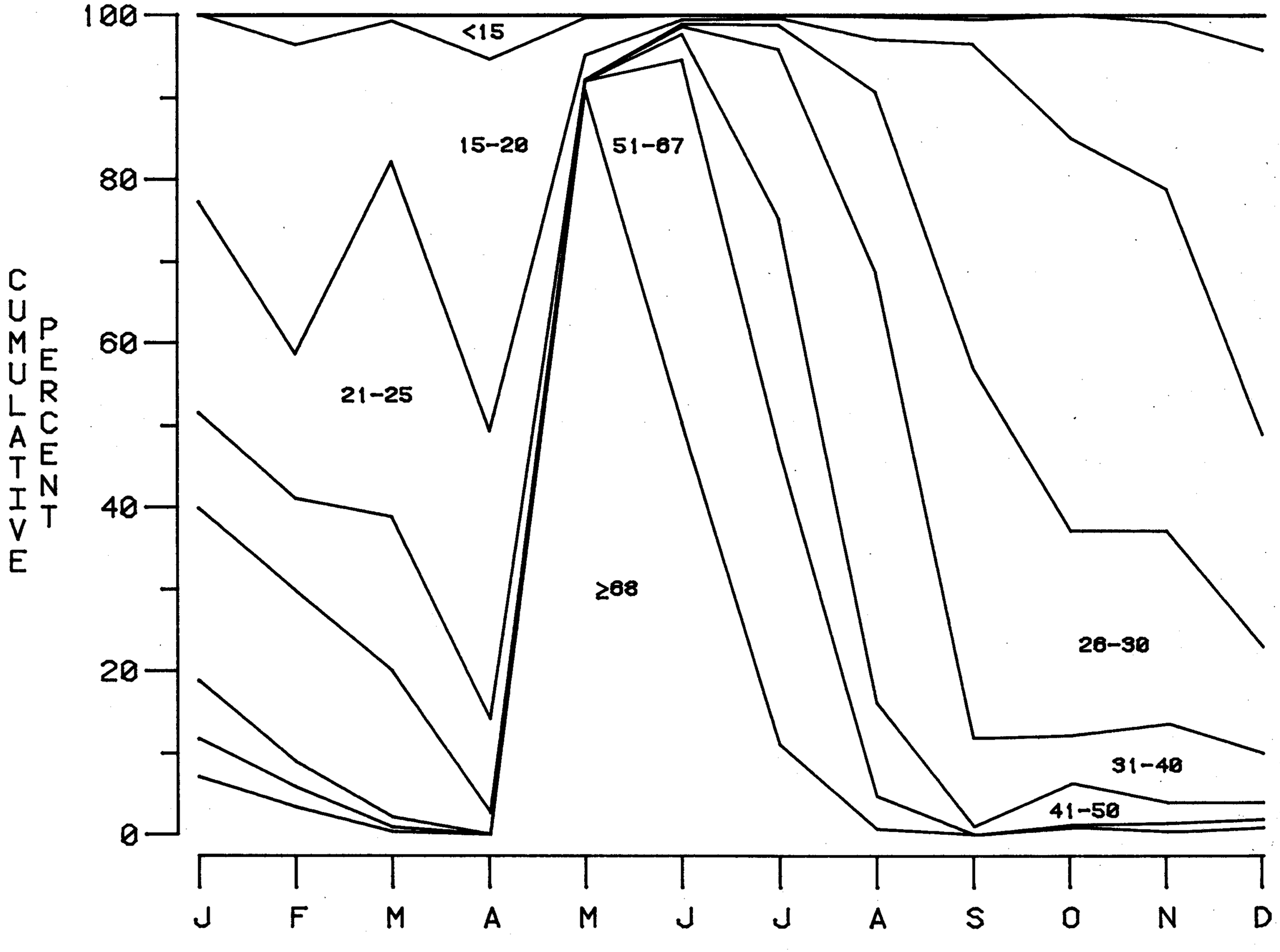

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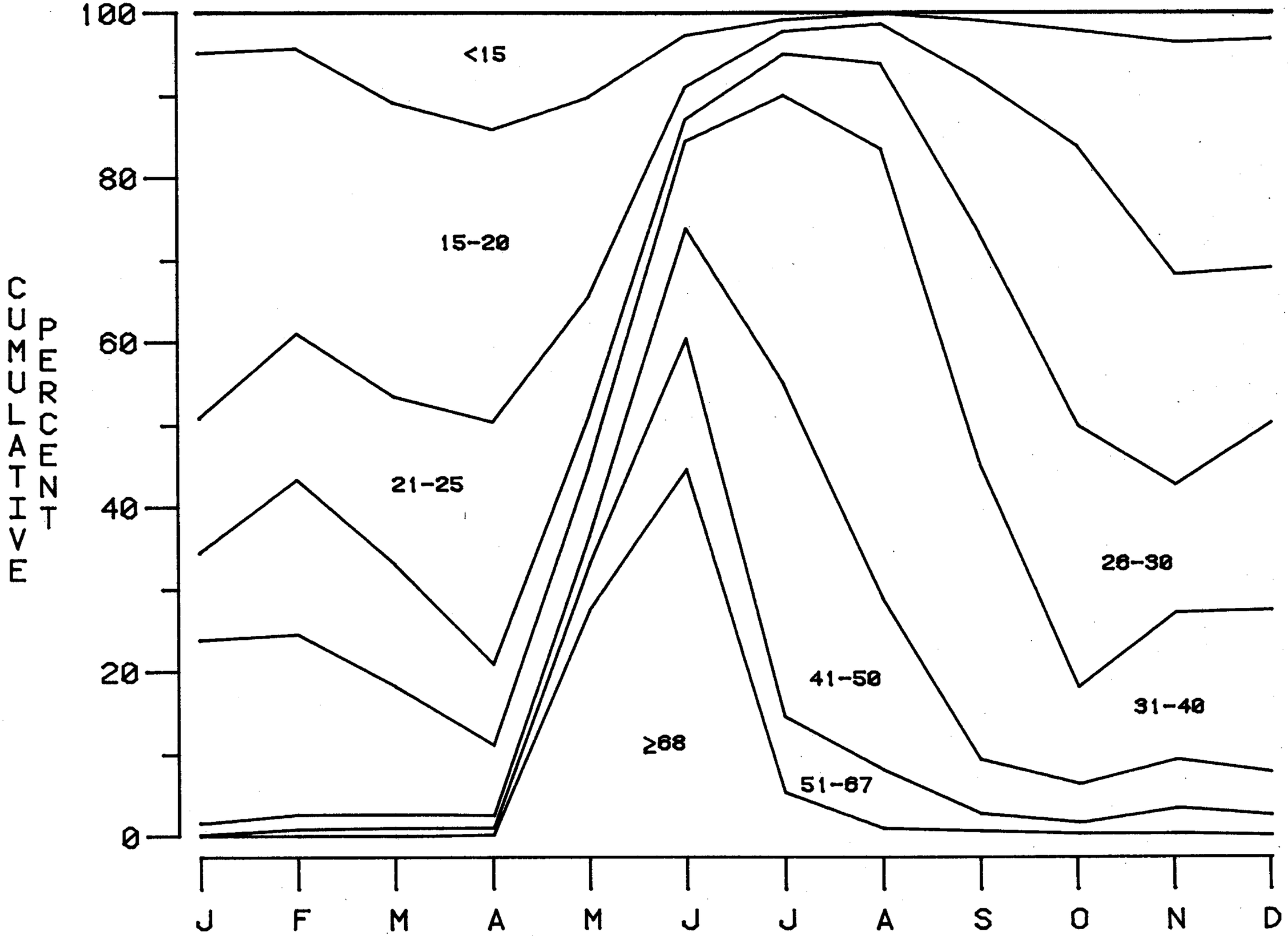

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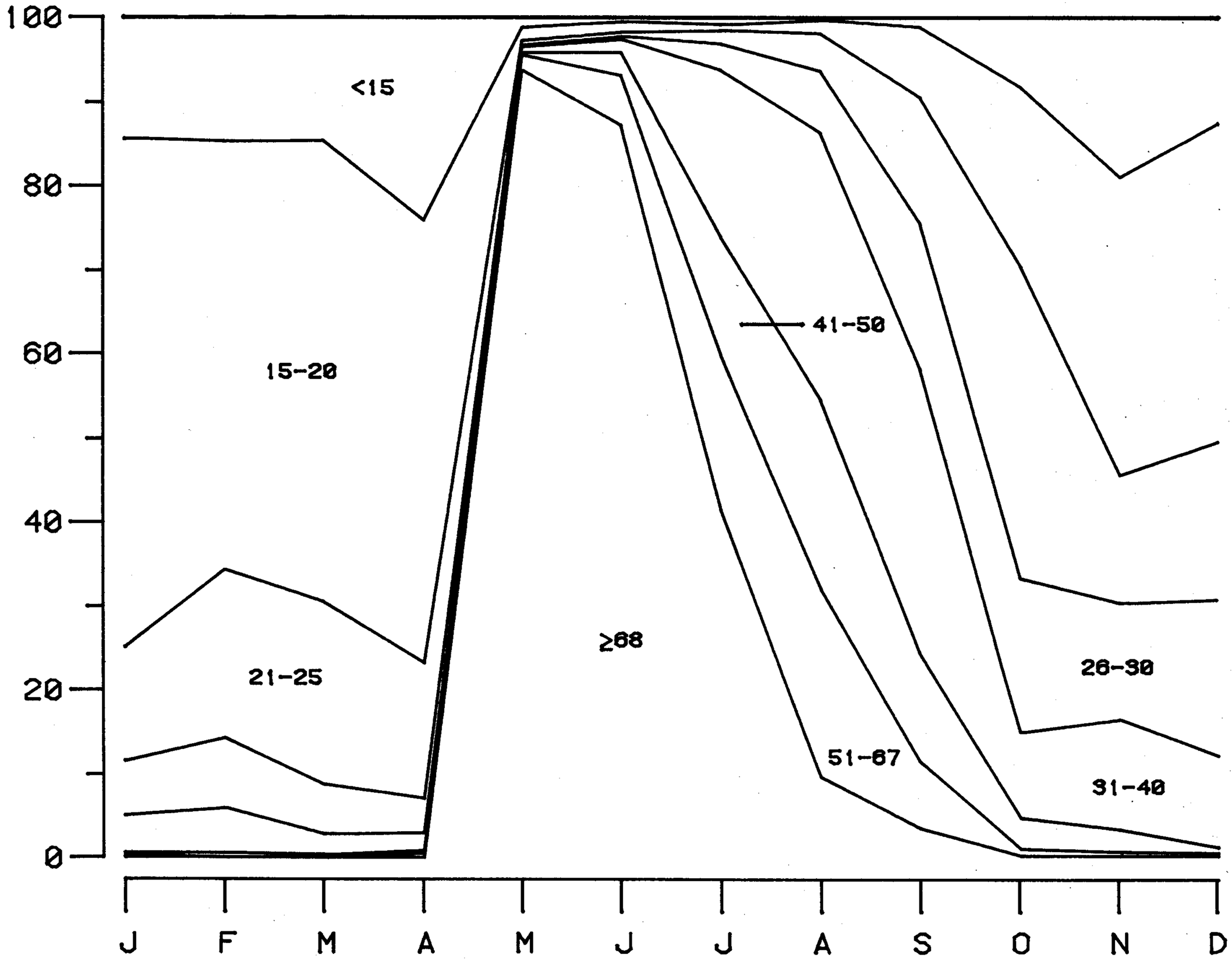

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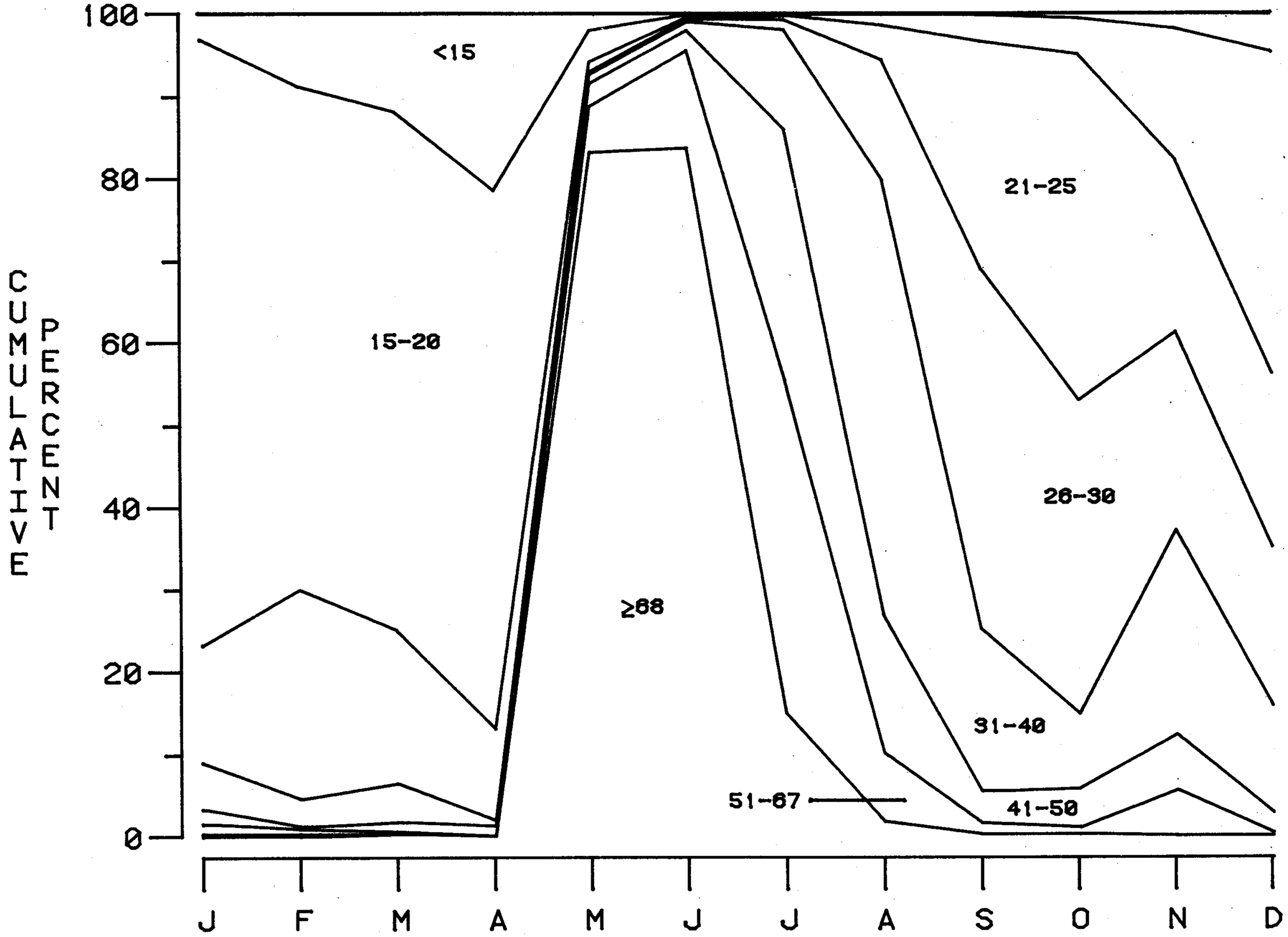

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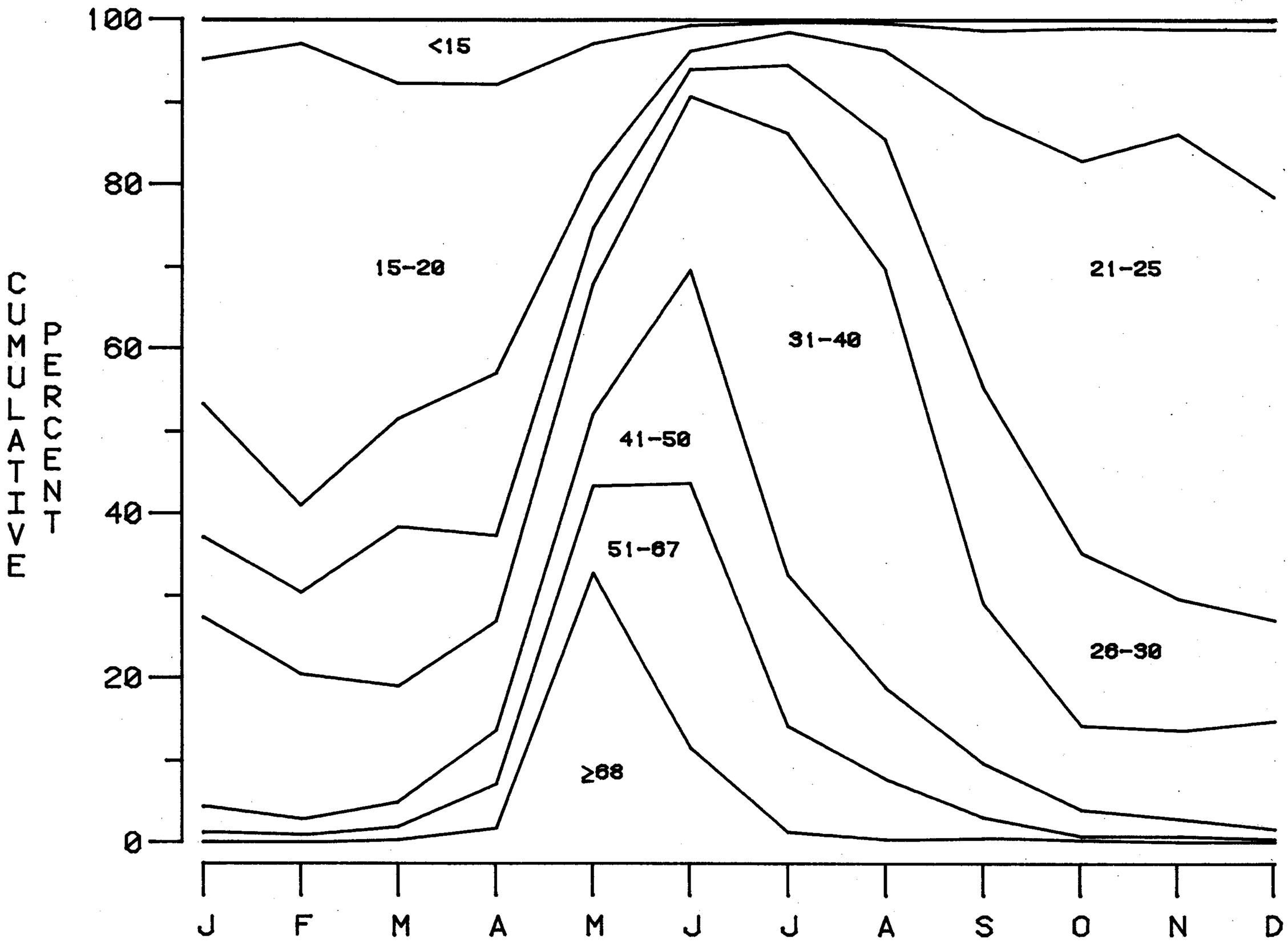
1972



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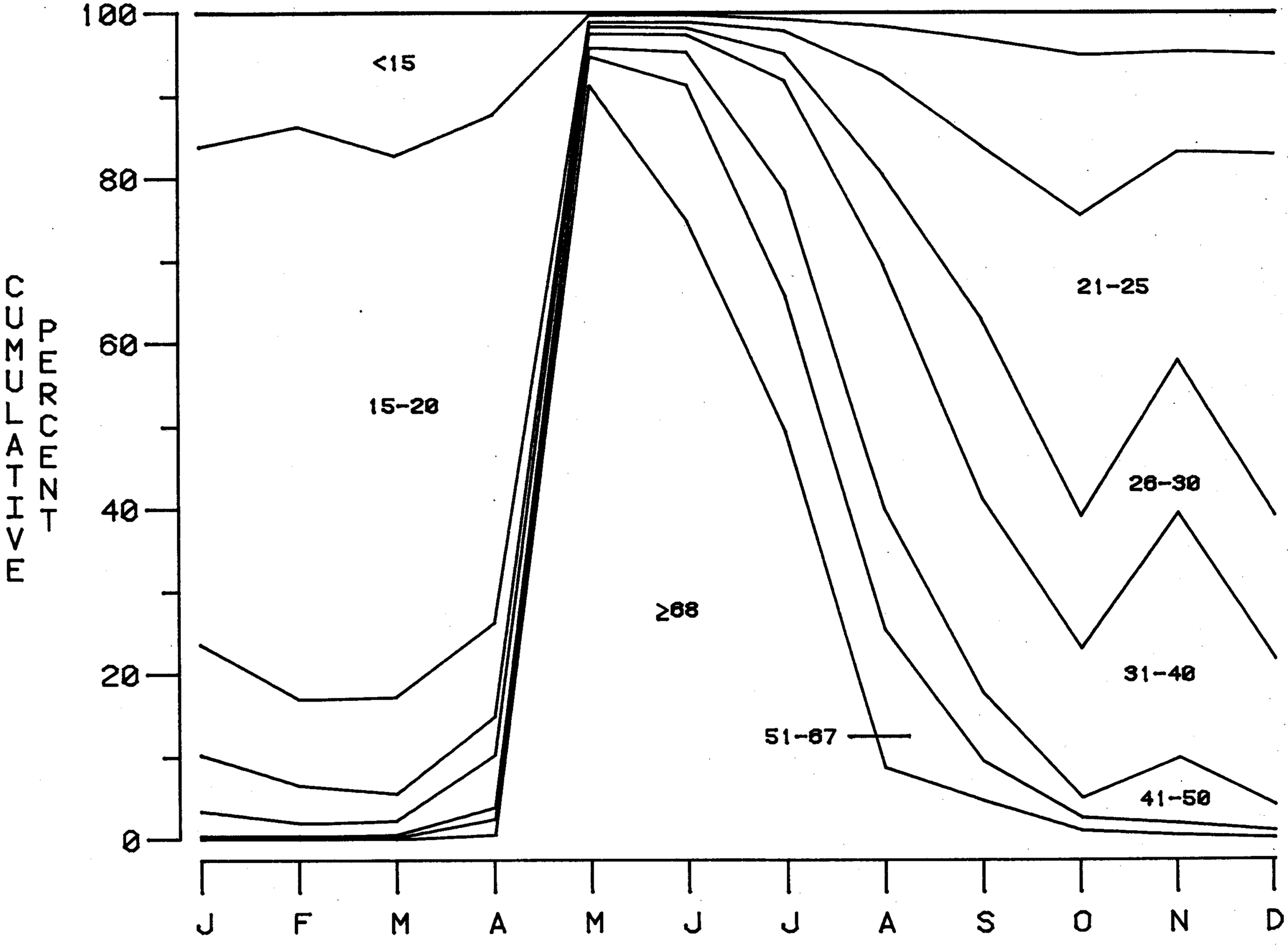
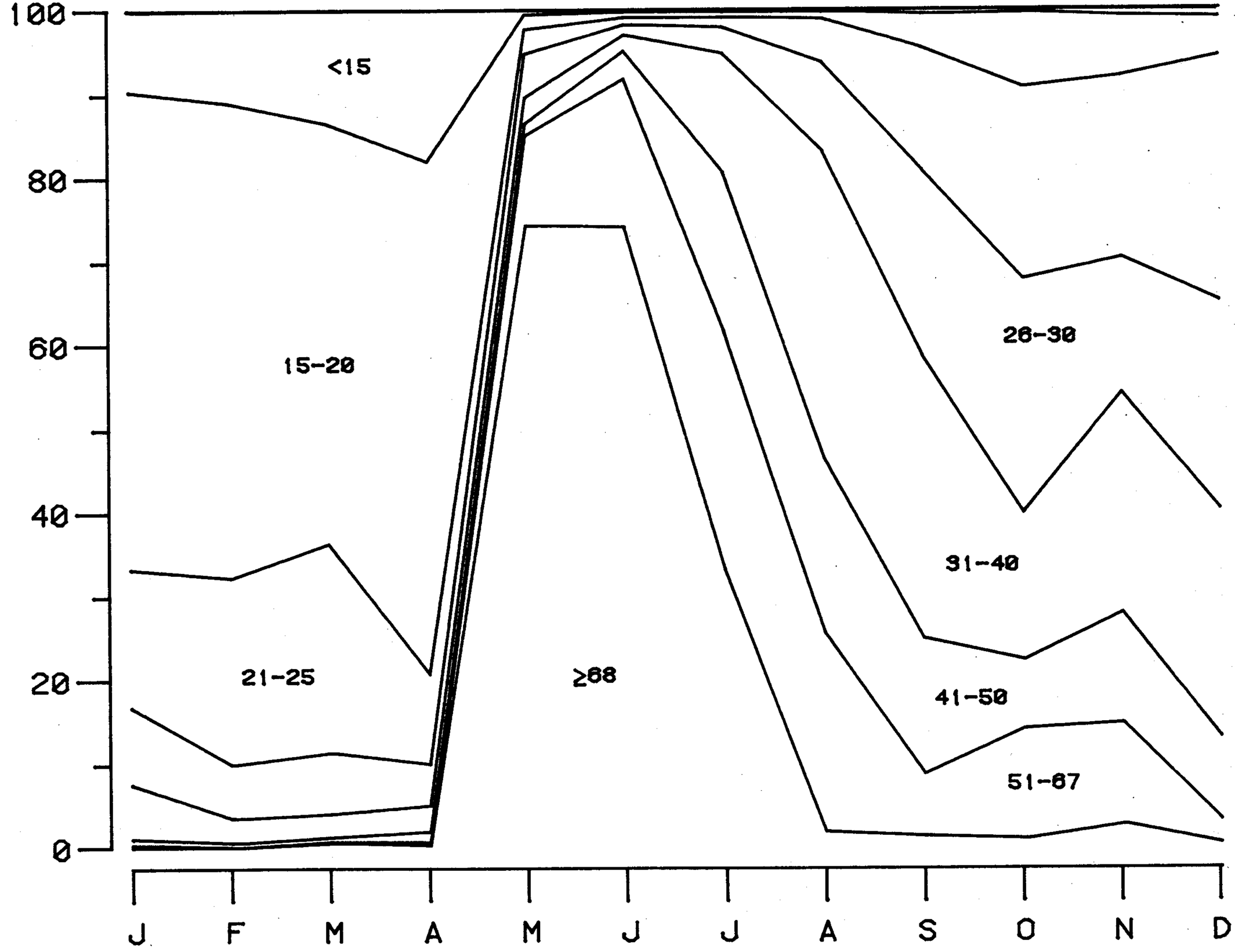
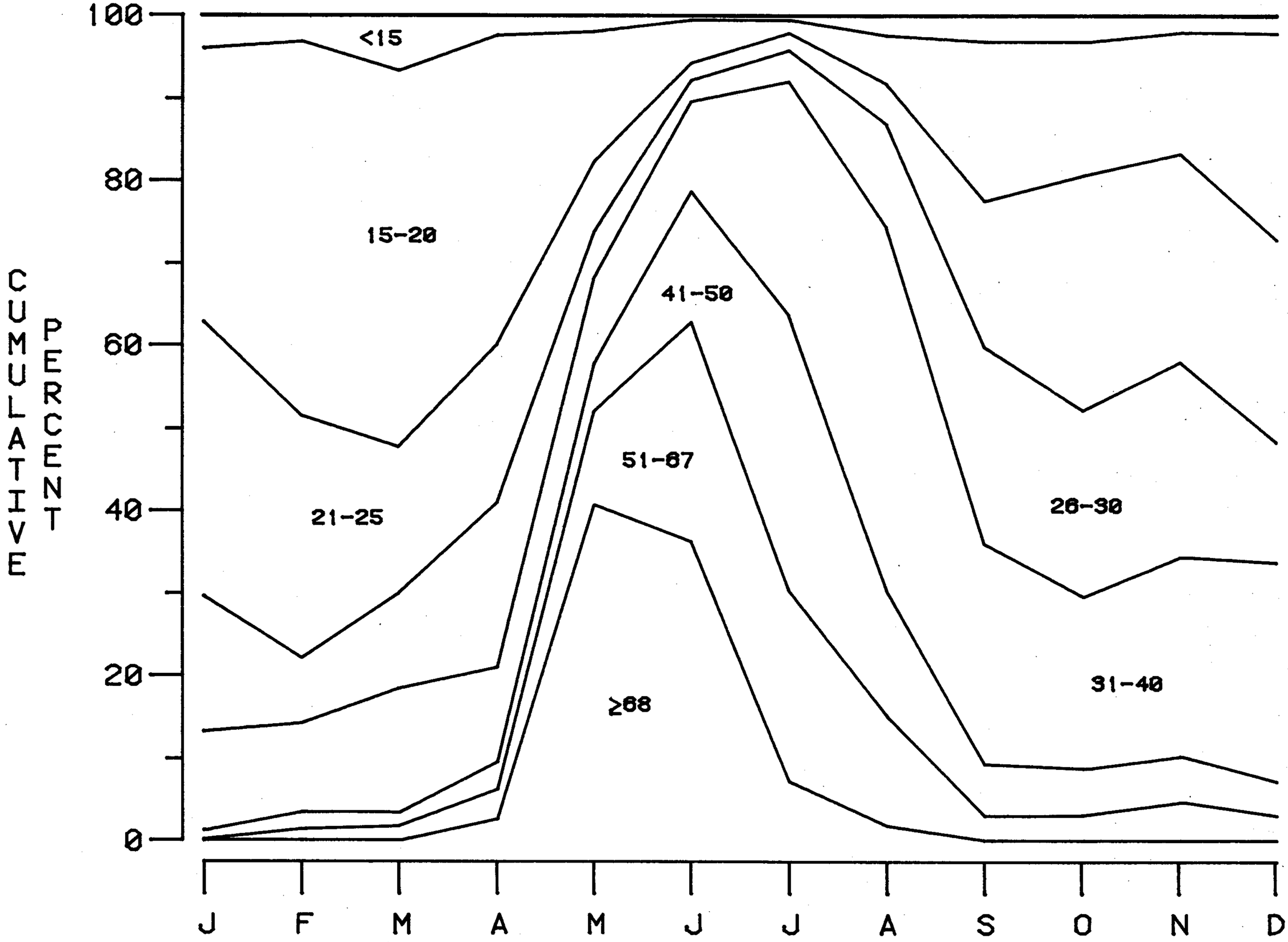
MISSISSIPPI RIVER TO TEXAS
1972



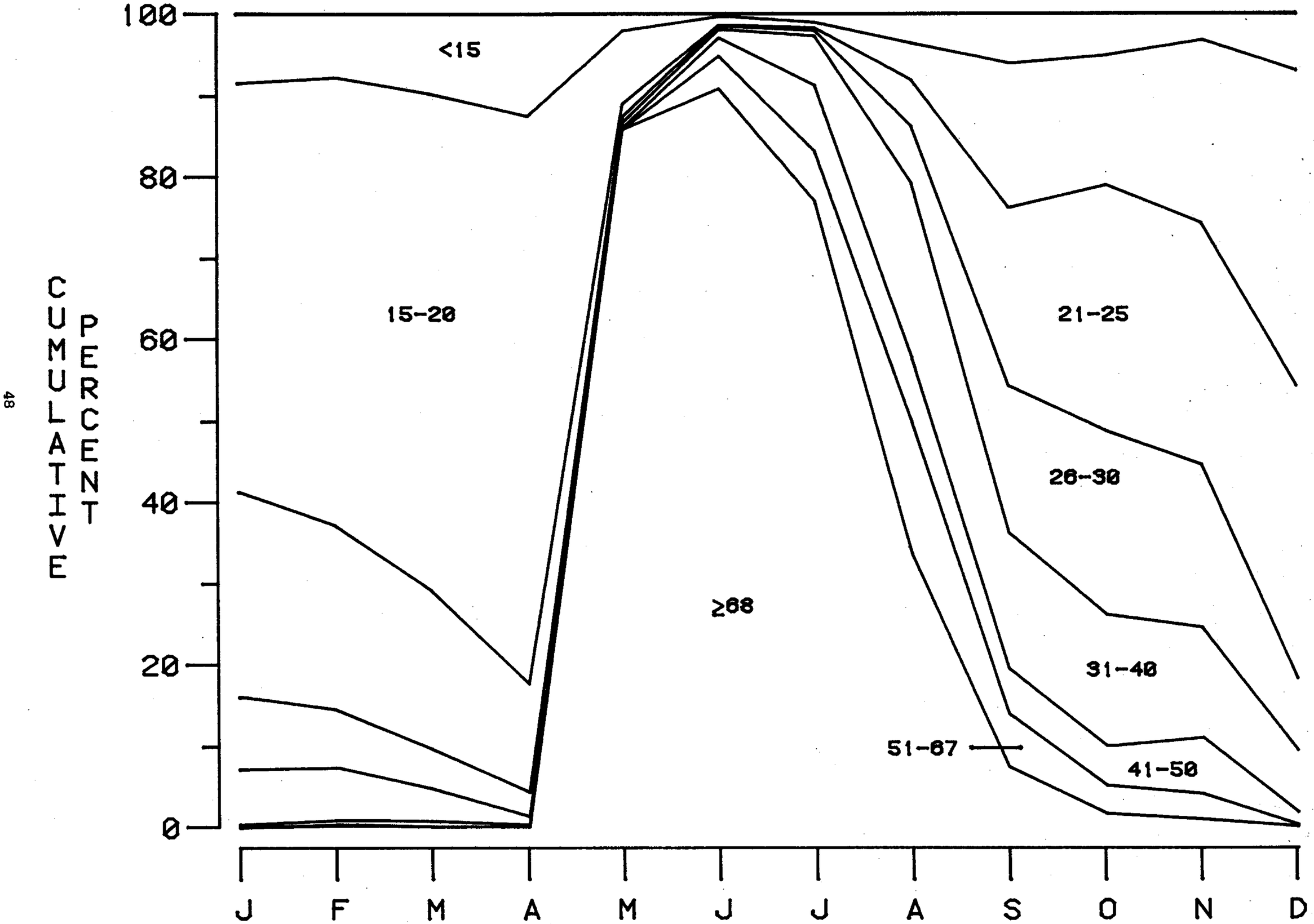
BROWN SHRIMP
PENSACOLA TO THE MISSISSIPPI RIVER
1972



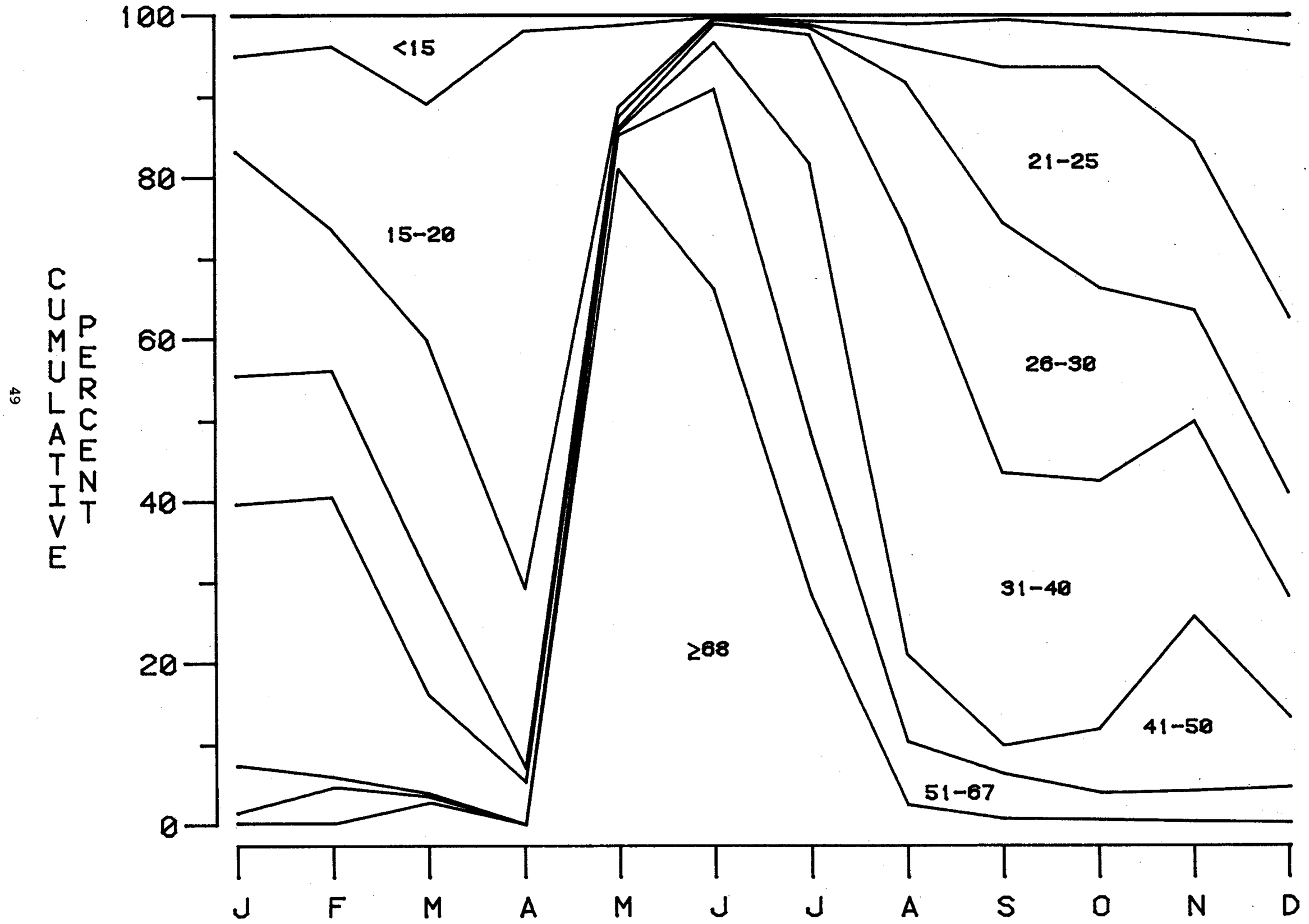
BROWN SHRIMP
TEXAS COAST
1973



BROWN SHRIMP
MISSISSIPPI RIVER TO TEXAS
1973



BROWN SHRIMP
PENSACOLA TO THE MISSISSIPPI RIVER
1973



BROWN SHRIMP
TEXAS COAST
1974

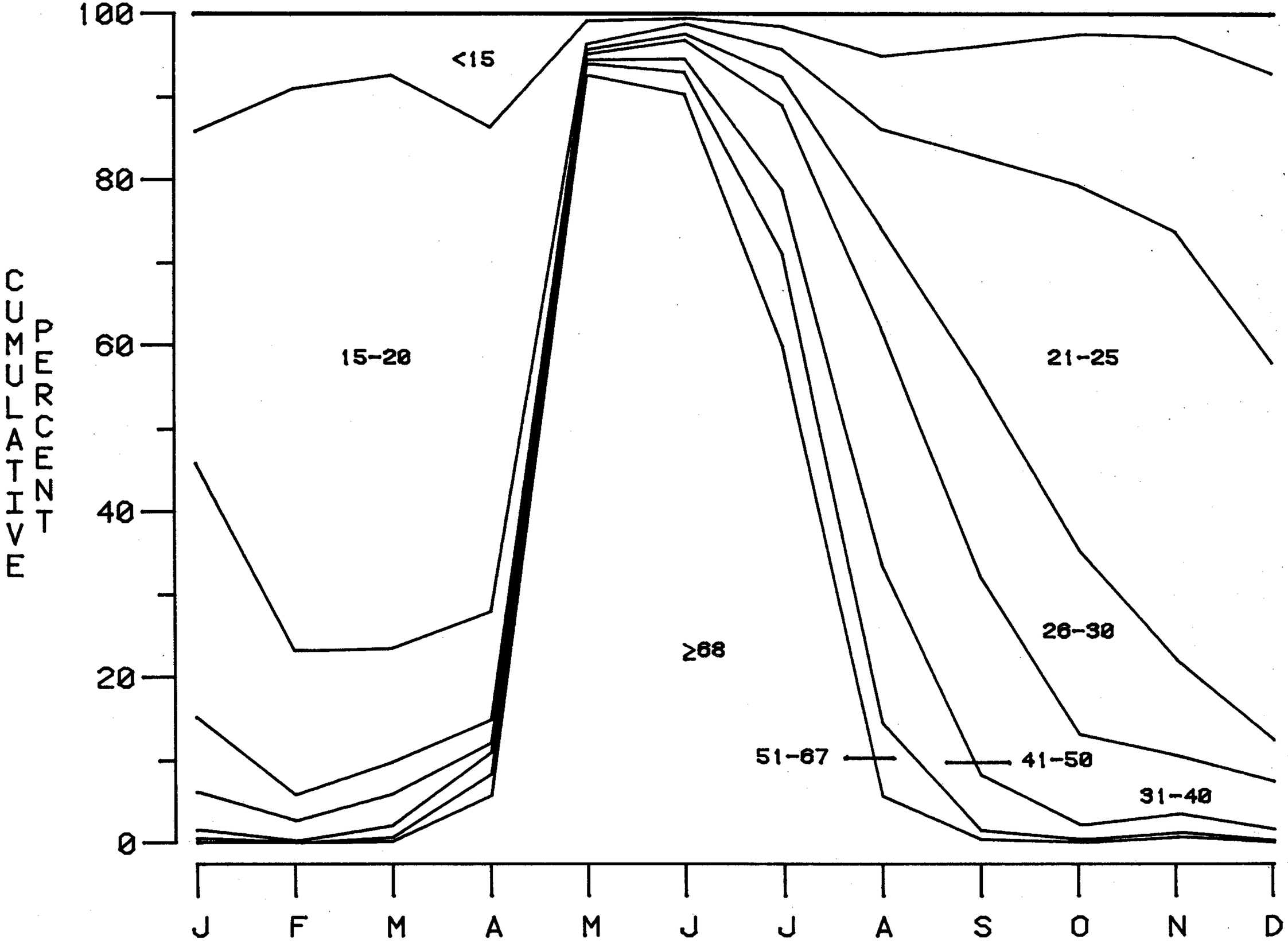
CUMULATIVE PERCENT

100
80
60
40
20
0

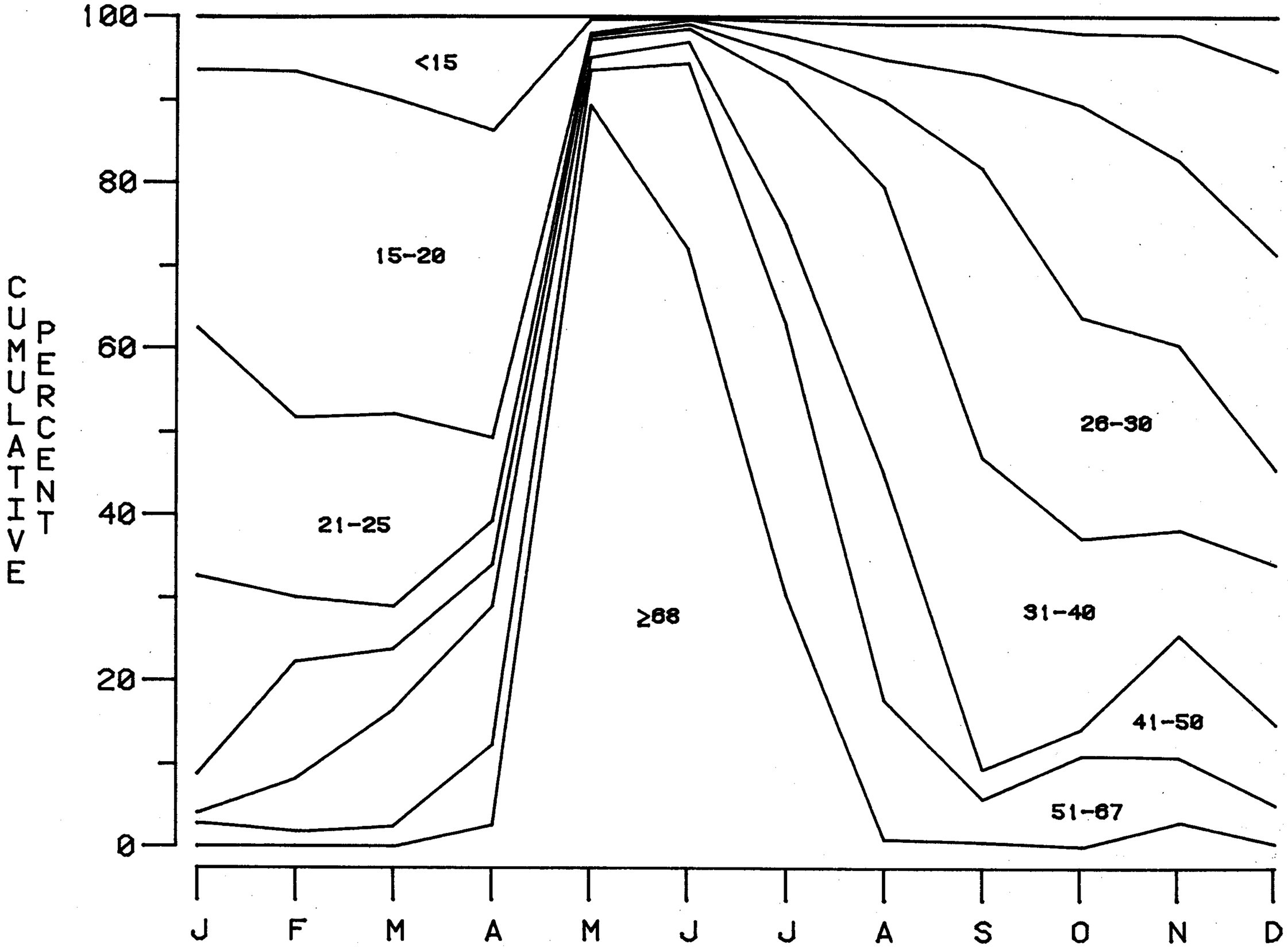
<15
15-20
21-25
26-30
31-40
41-50
51-67
≥68

J F M A M J J A S O N D

BROWN SHRIMP
MISSISSIPPI RIVER TO TEXAS
1974



BROWN SHRIMP
PENSACOLA TO THE MISSISSIPPI RIVER
1974



BROWN SHRIMP
TEXAS COAST
1975

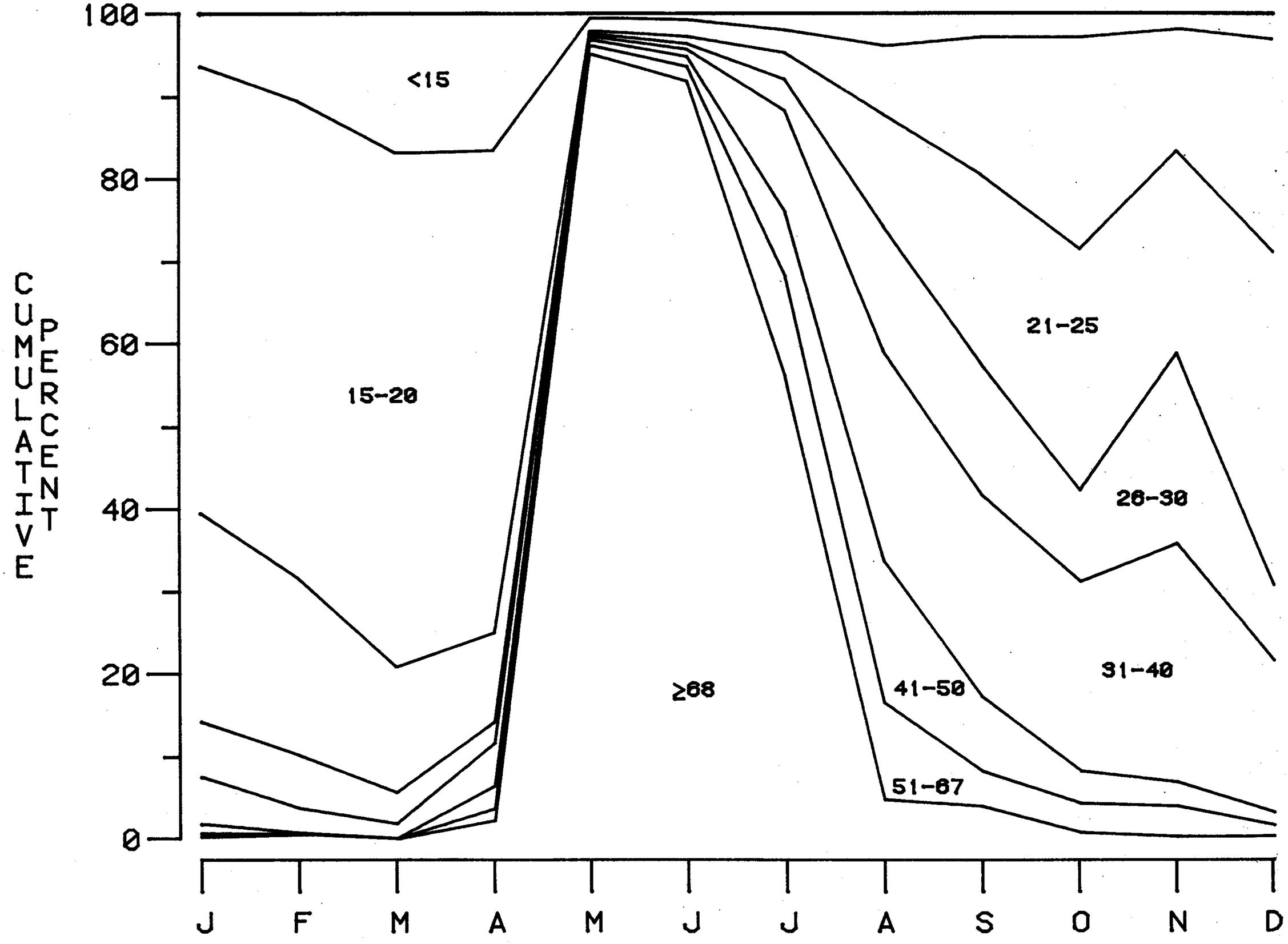
CUMULATIVE PERCENT

100
80
60
40
20
0

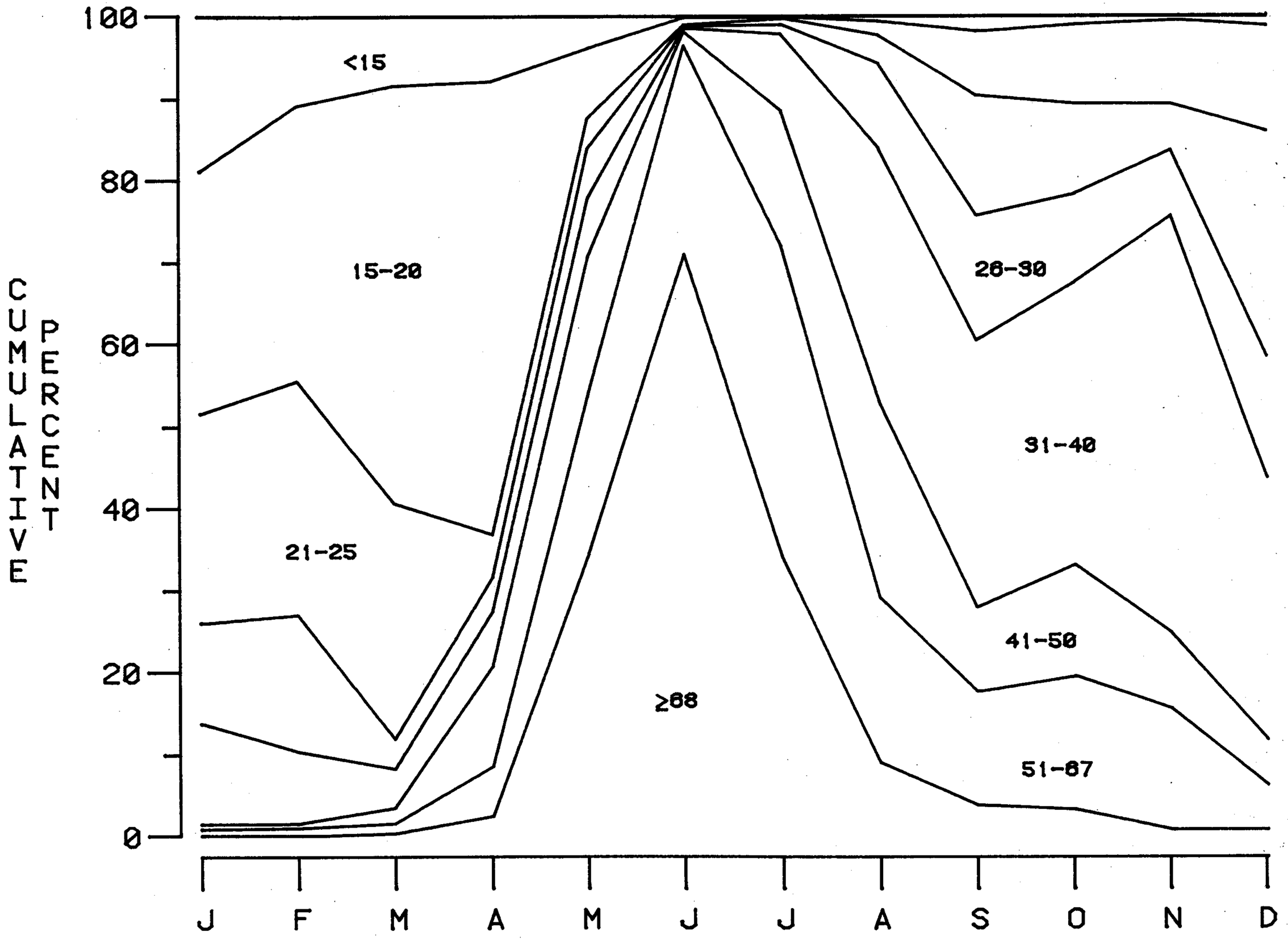
<15
15-20
41-50
21-25
26-30
51-67
31-40
≥68

J F M A M J J A S O N D

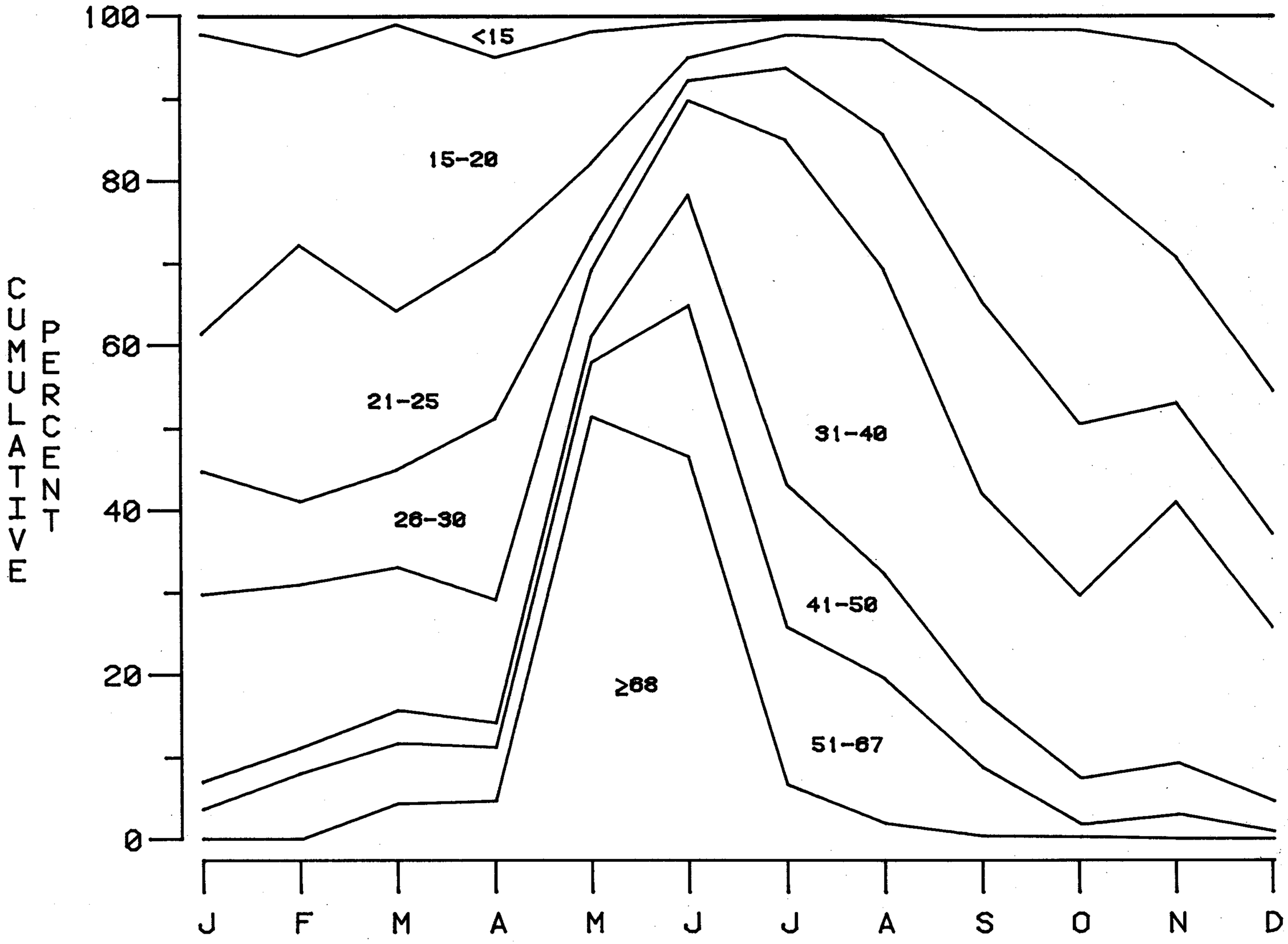
BROWN SHRIMP
MISSISSIPPI RIVER TO TEXAS
1975



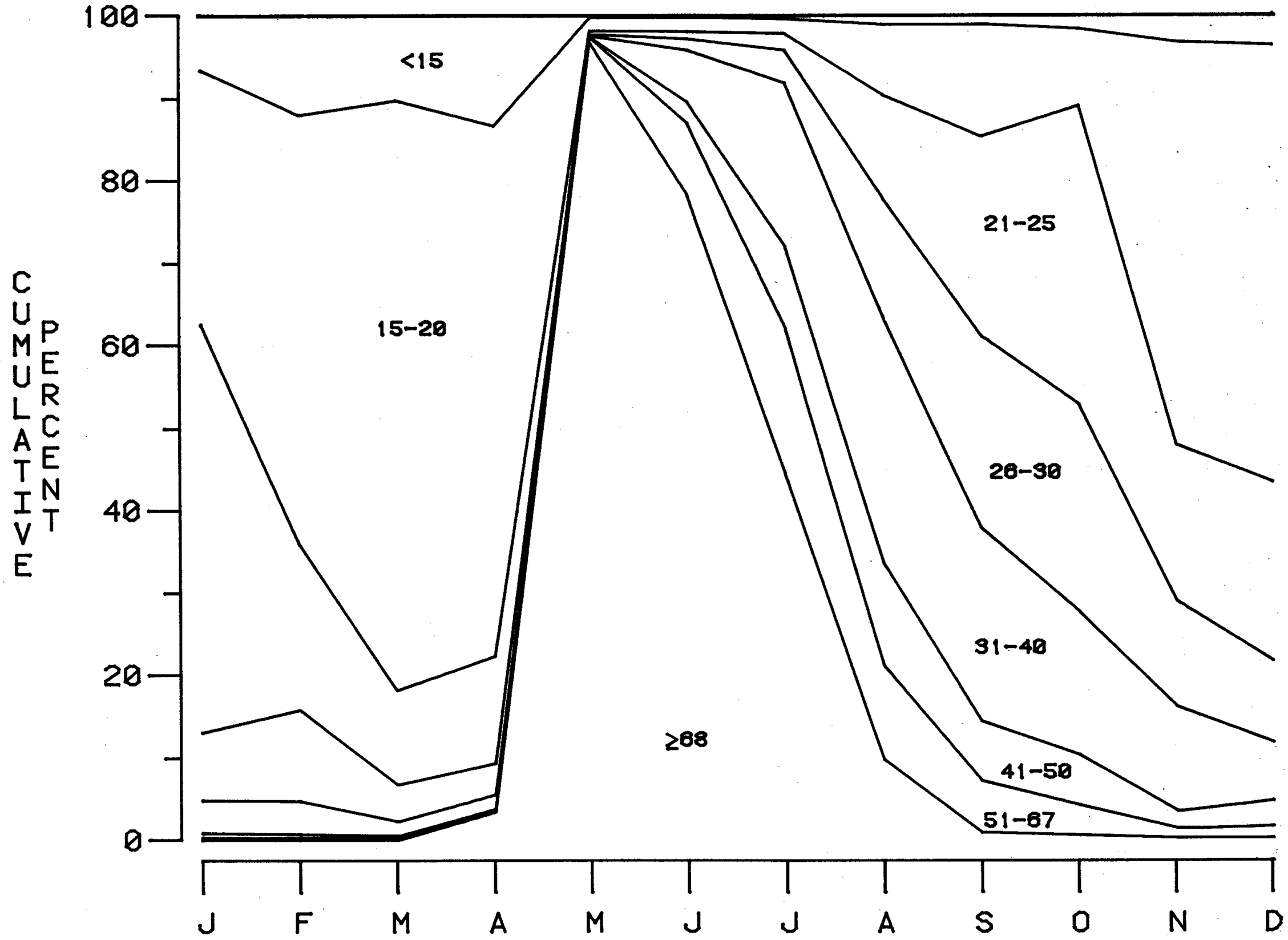
BROWN SHRIMP
PENSACOLA TO THE MISSISSIPPI RIVER
1975



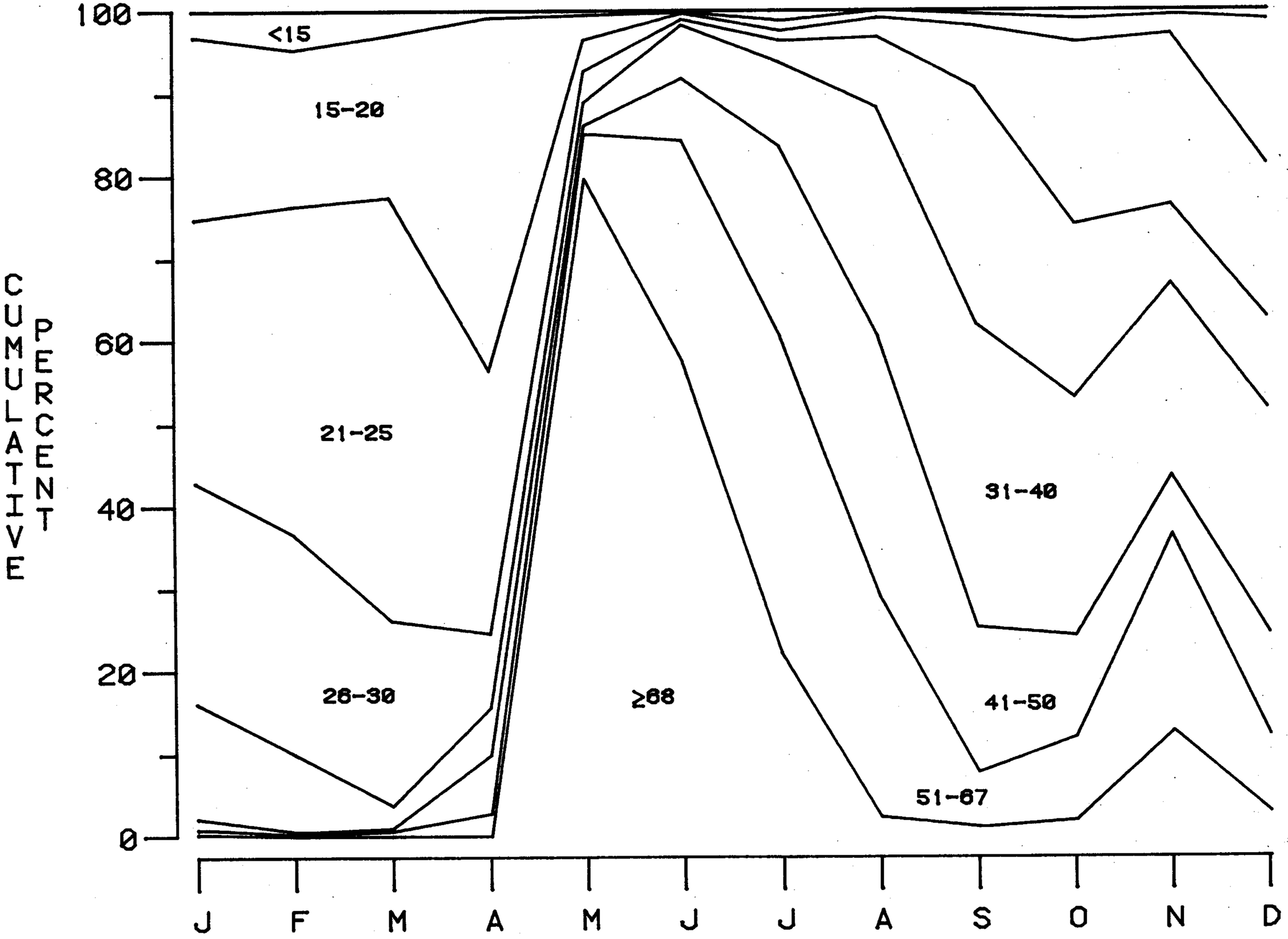
BROWN SHRIMP
TEXAS COAST
1976



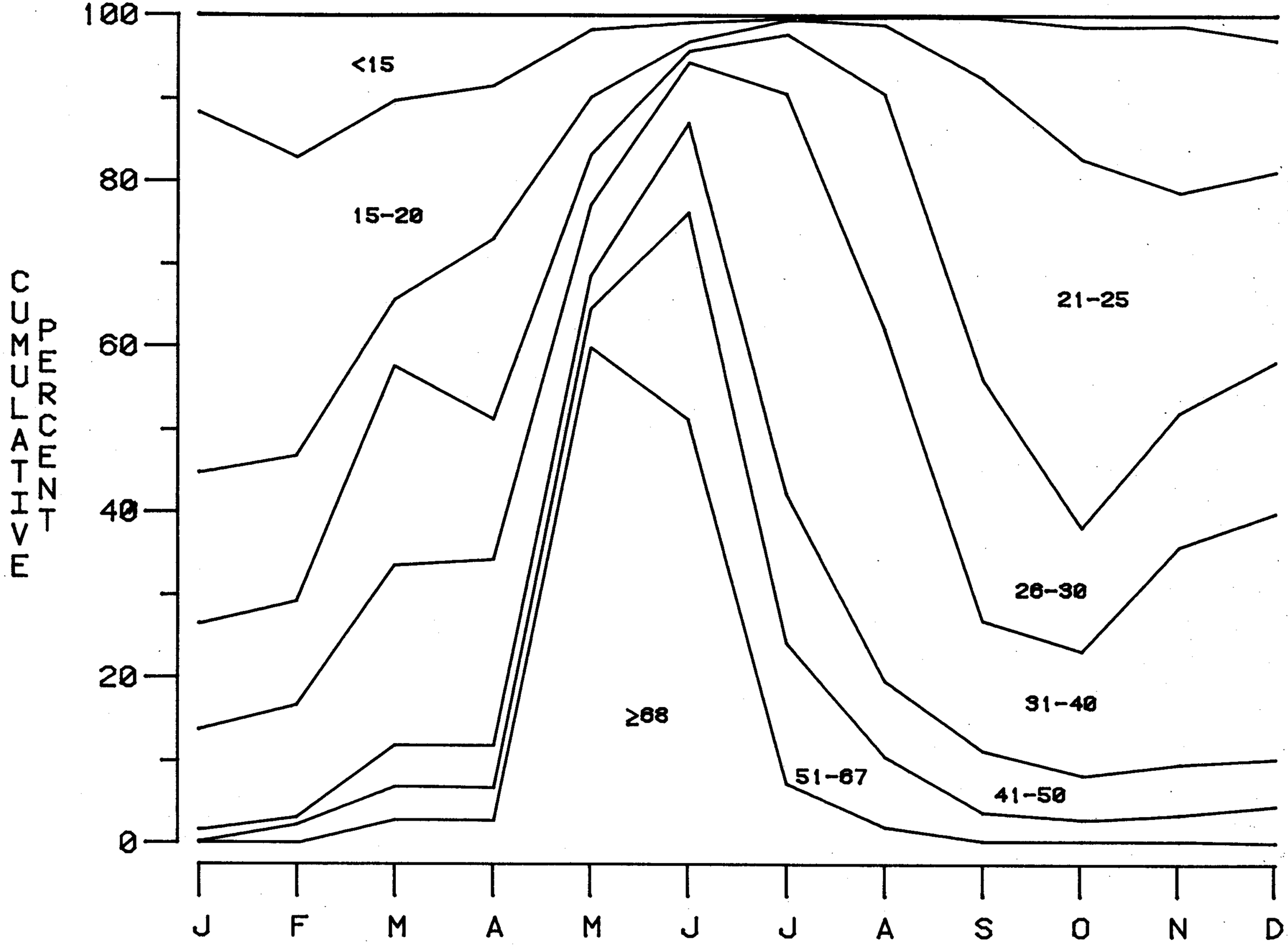
BROWN SHRIMP
MISSISSIPPI RIVER TO TEXAS
1976



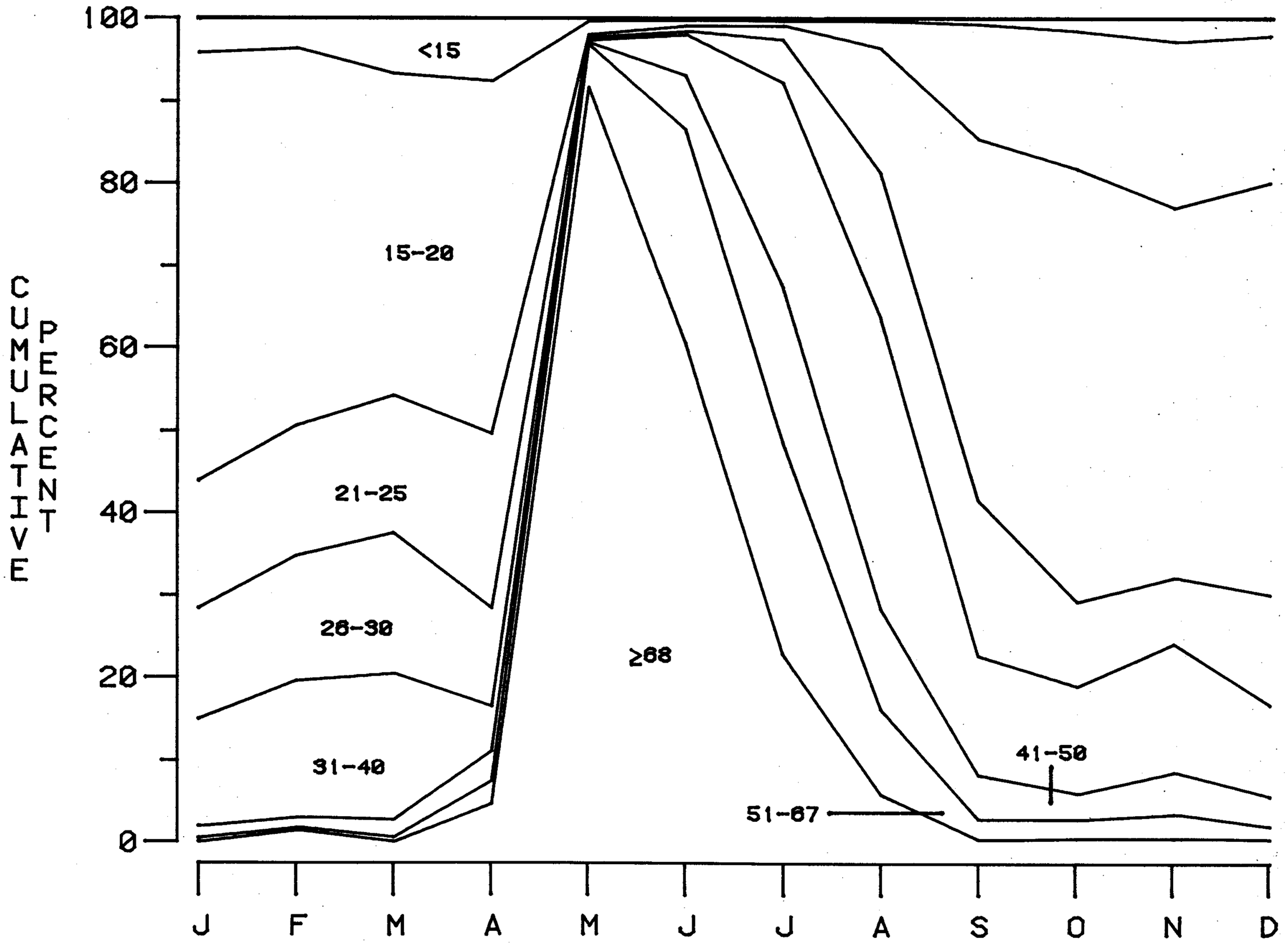
BROWN SHRIMP
PENSACOLA TO THE MISSISSIPPI RIVER
1976



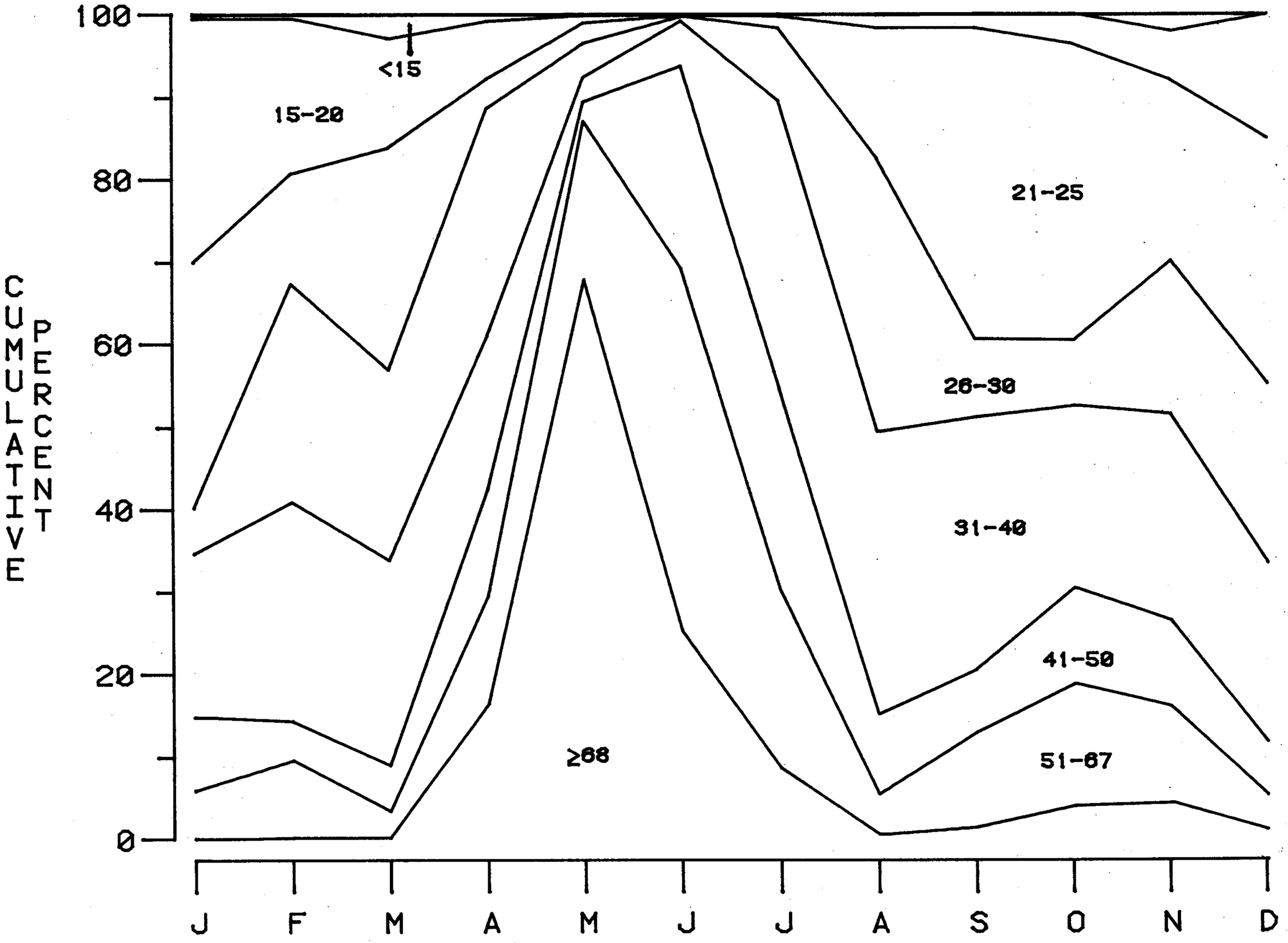
BROWN SHRIMP
TEXAS COAST
1977



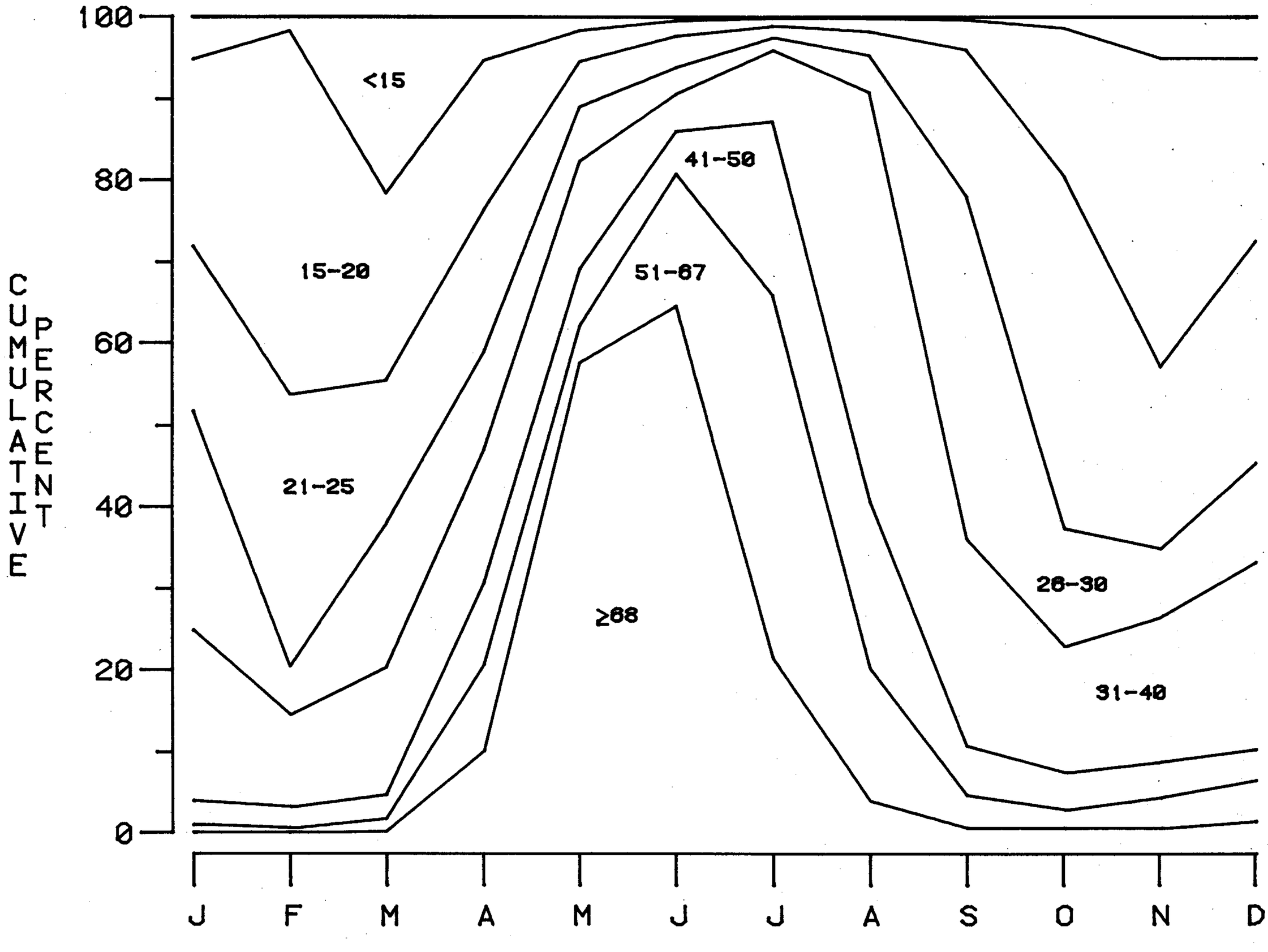
BROWN SHRIMP
MISSISSIPPI RIVER TO TEXAS
1977



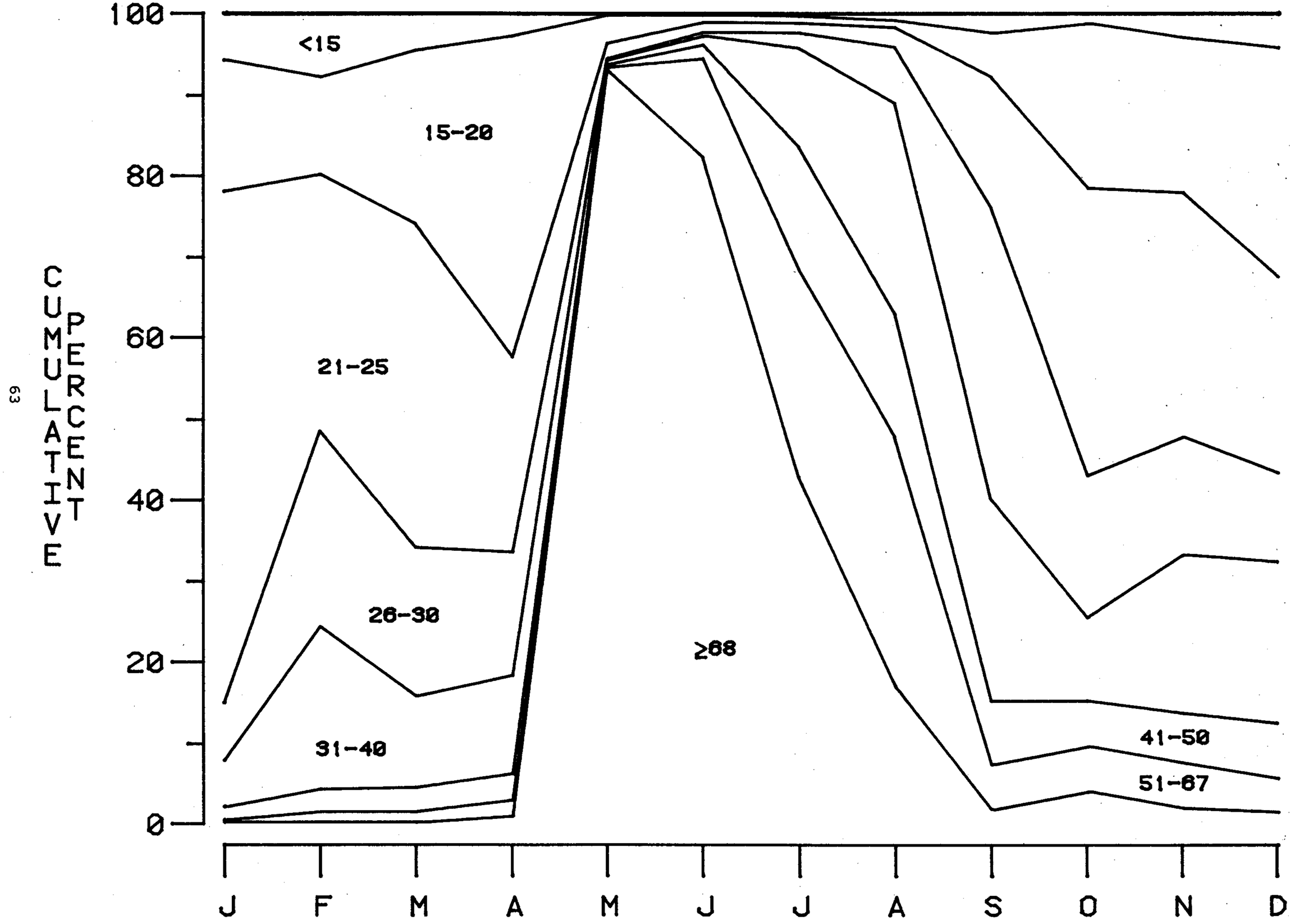
BROWN SHRIMP
PENSACOLA TO THE MISSISSIPPI RIVER
1977



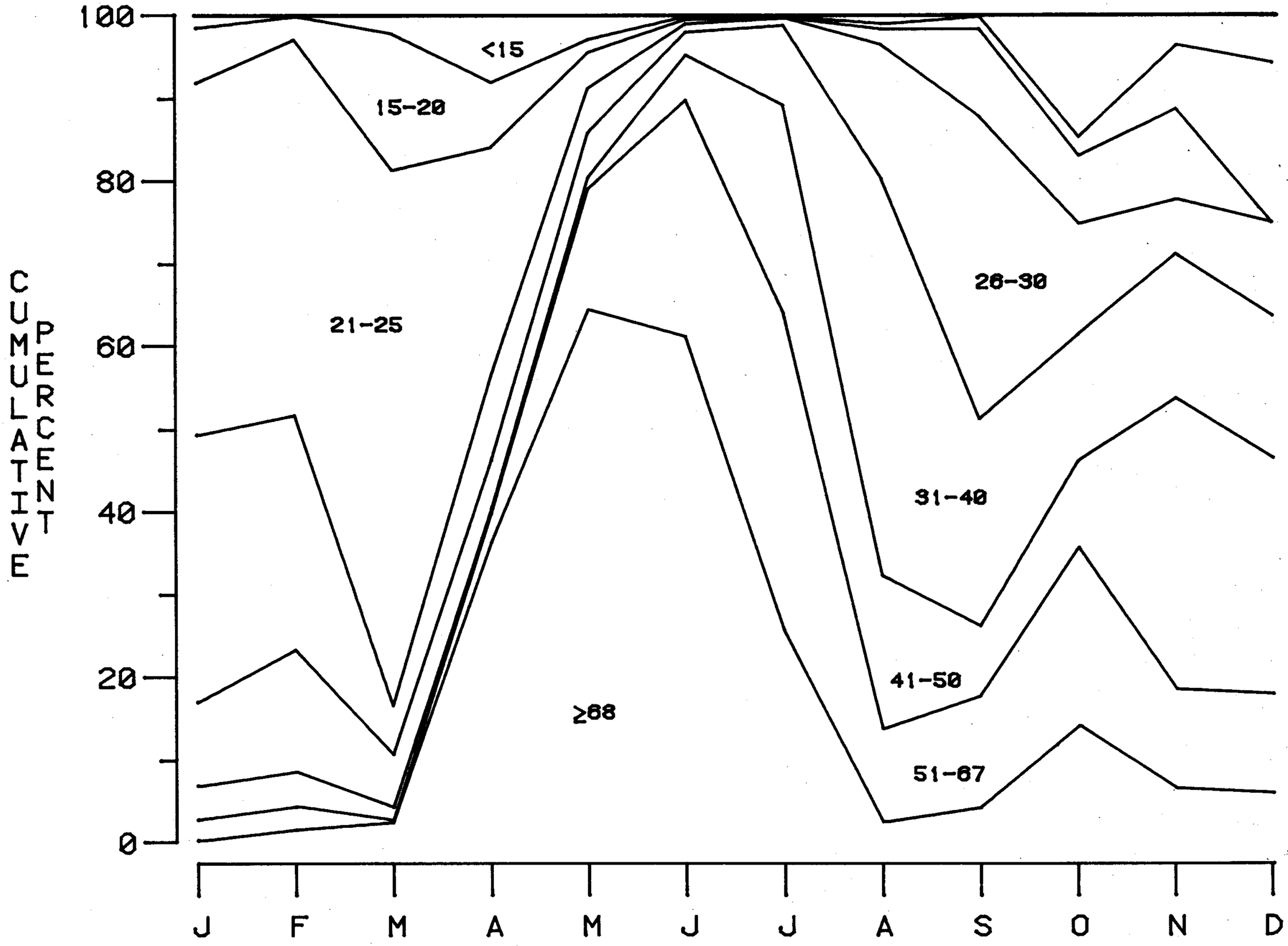
BROWN SHRIMP
TEXAS COAST
1978



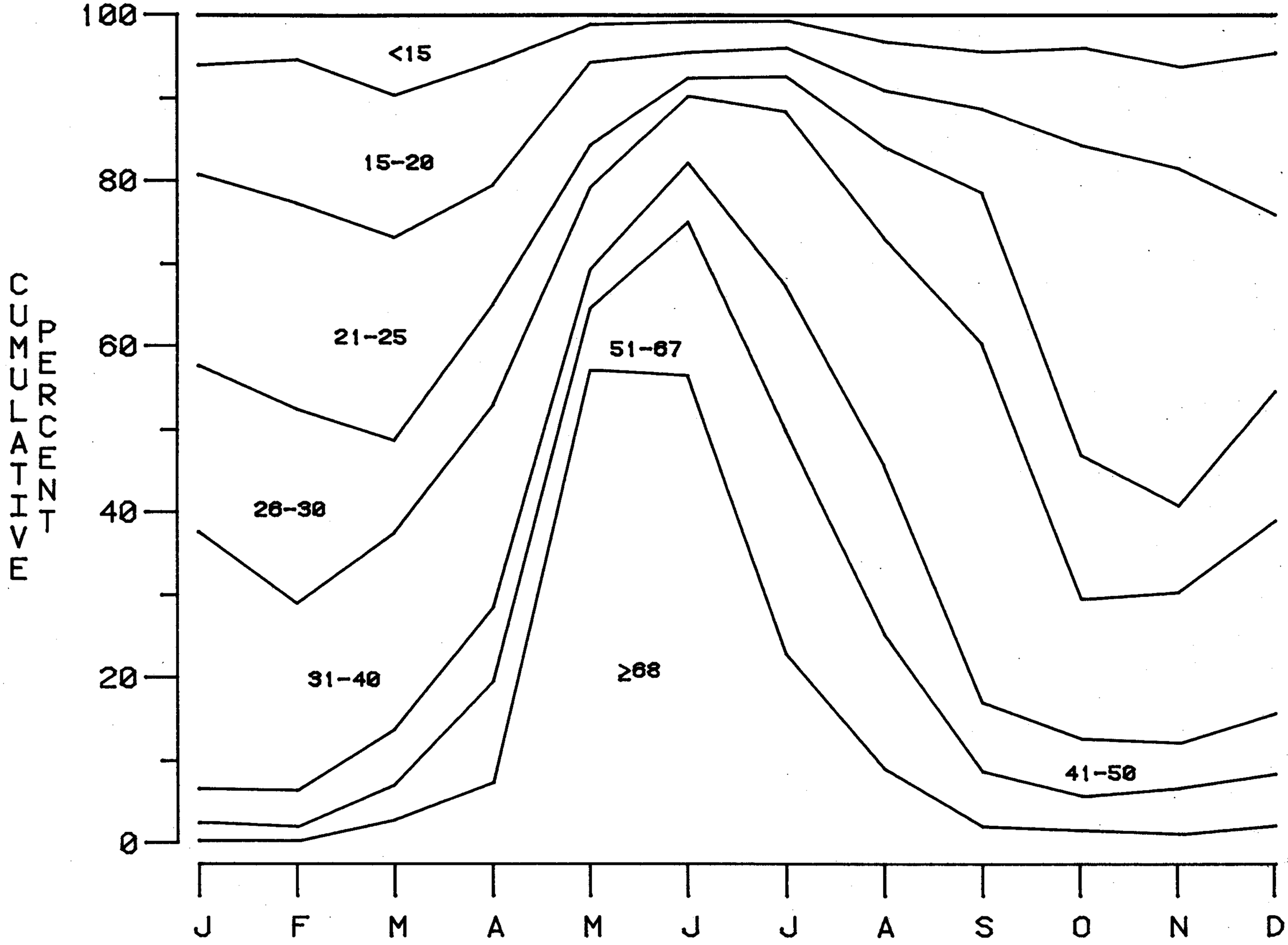
BROWN SHRIMP
MISSISSIPPI RIVER TO TEXAS
1978



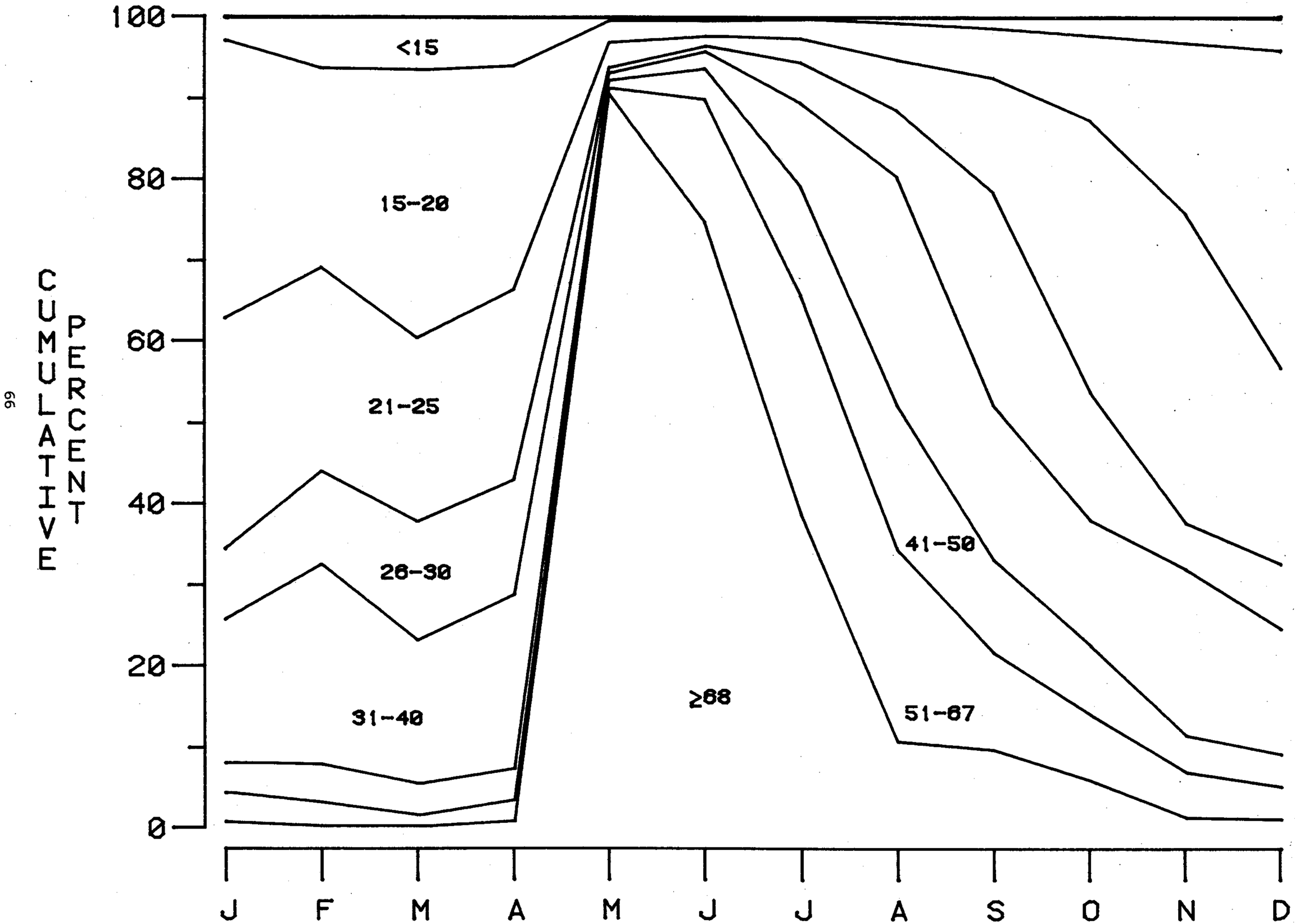
BROWN SHRIMP
PENSACOLA TO THE MISSISSIPPI RIVER
1978



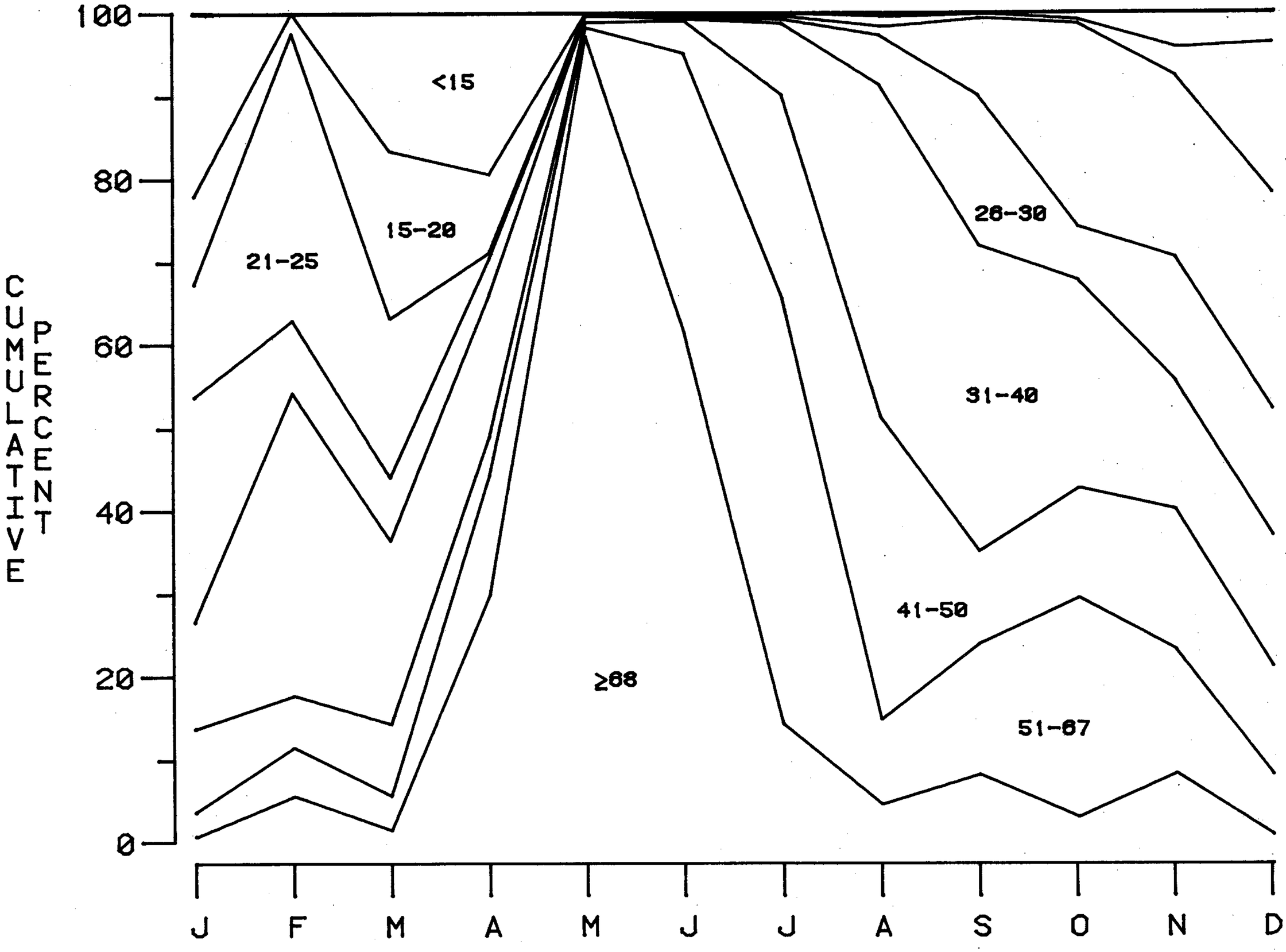
BROWN SHRIMP
TEXAS COAST
1979



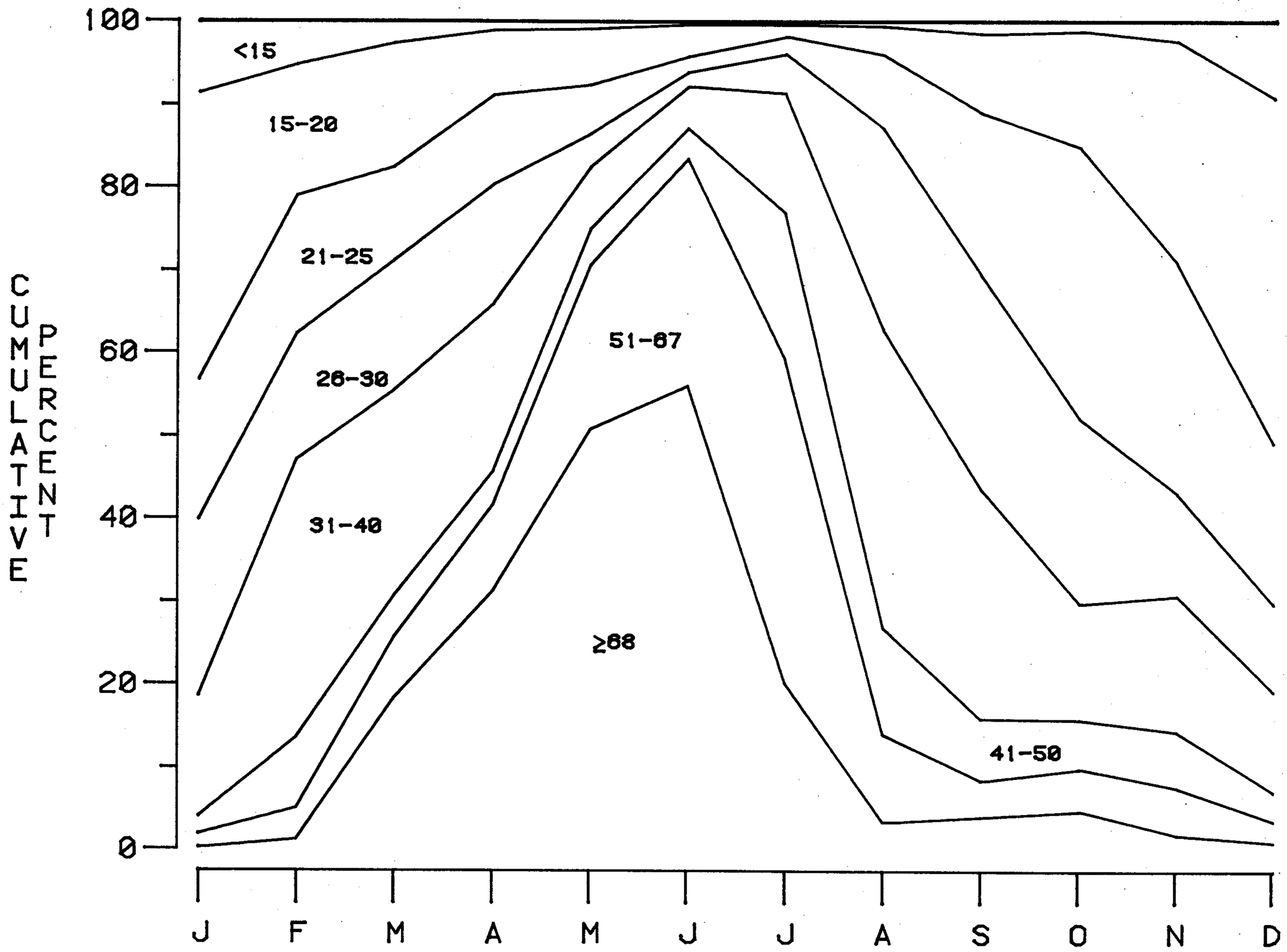
BROWN SHRIMP
MISSISSIPPI RIVER TO TEXAS
1979



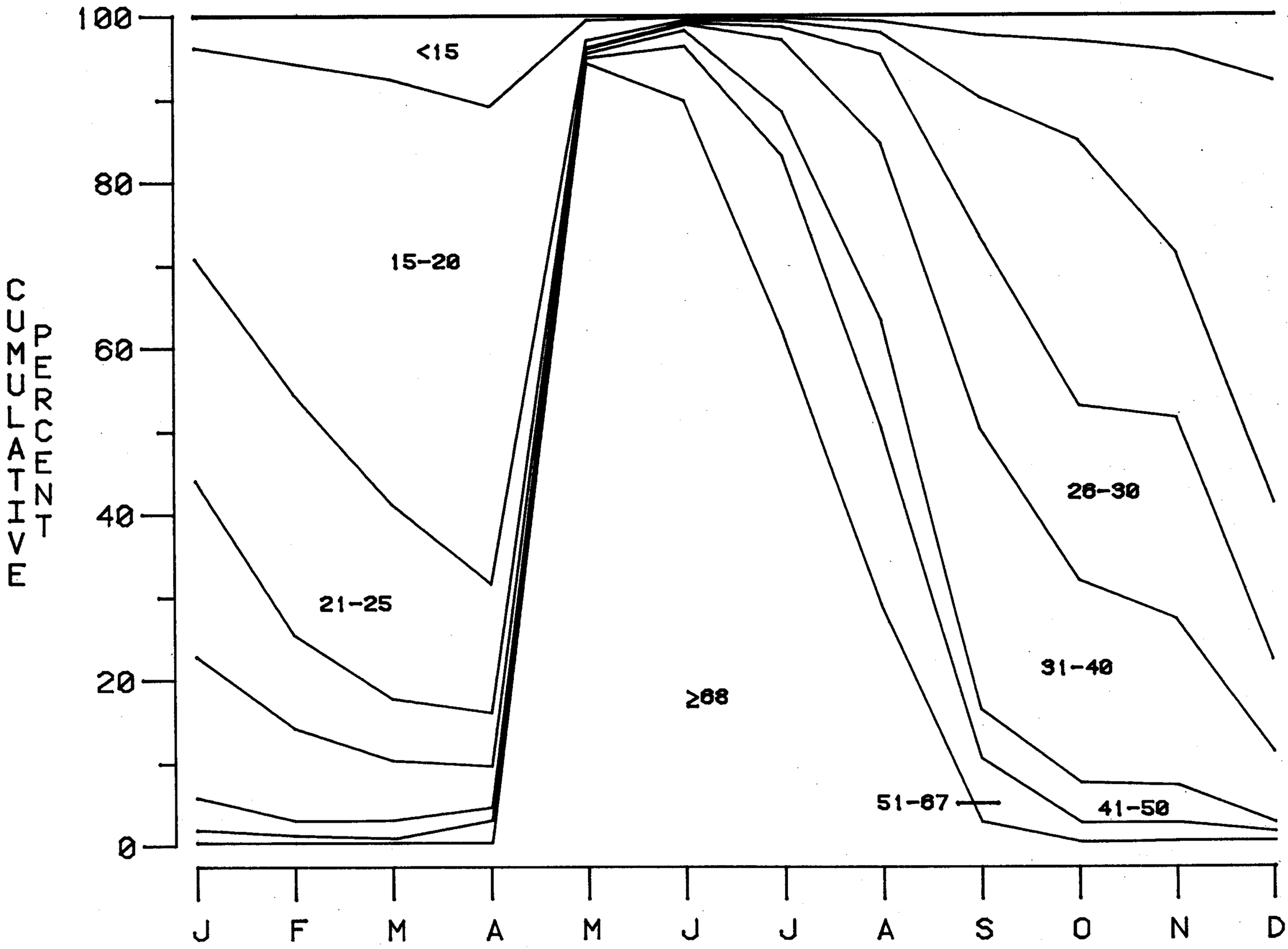
BROWN SHRIMP
PENSACOLA TO THE MISSISSIPPI RIVER
1979



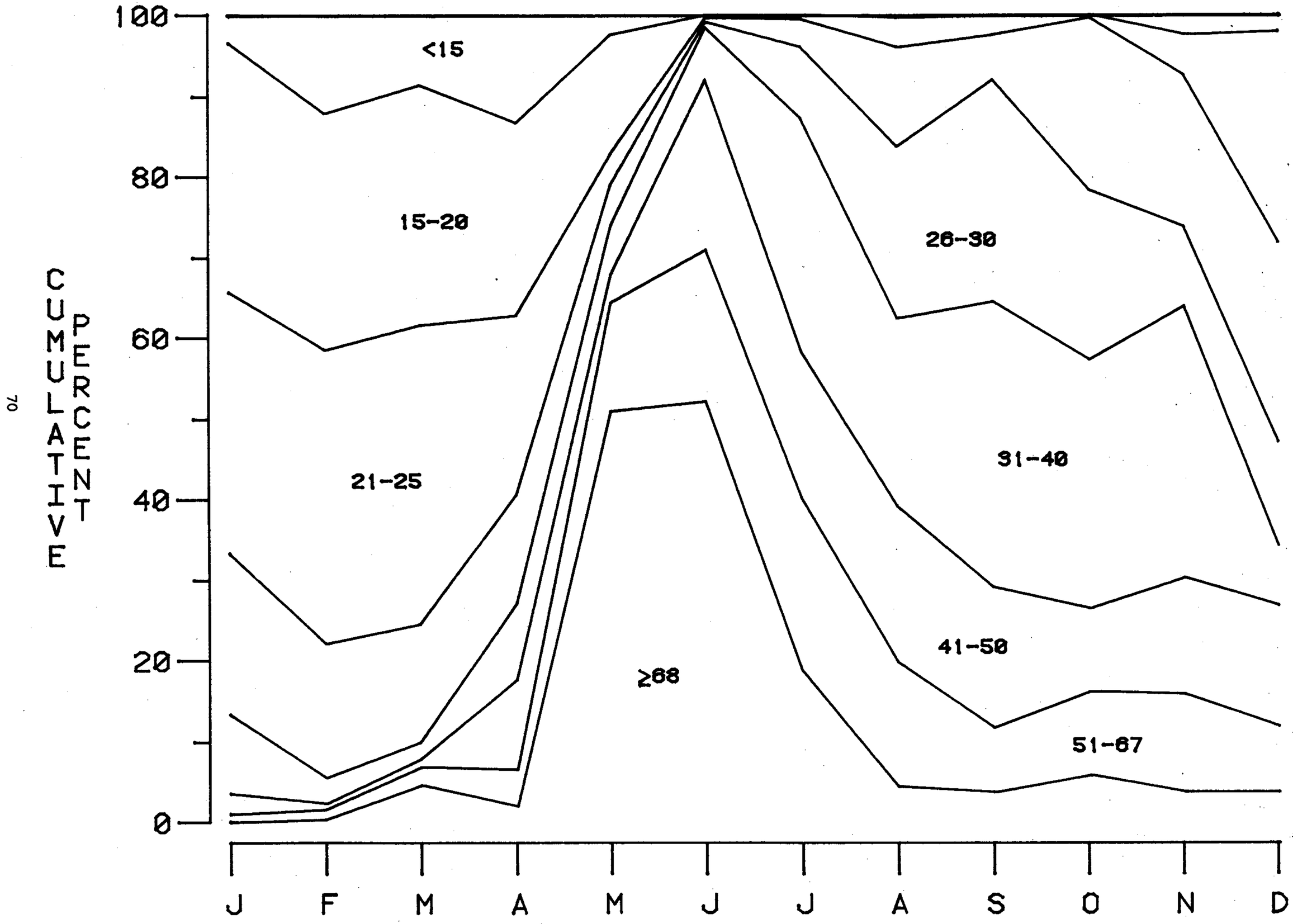
BROWN SHRIMP
TEXAS COAST
1980



BROWN SHRIMP
MISSISSIPPI RIVER TO TEXAS
1980



BROWN SHRIMP
PENSACOLA TO THE MISSISSIPPI RIVER
1980



BROWN SHRIMP
TEXAS COAST
1981

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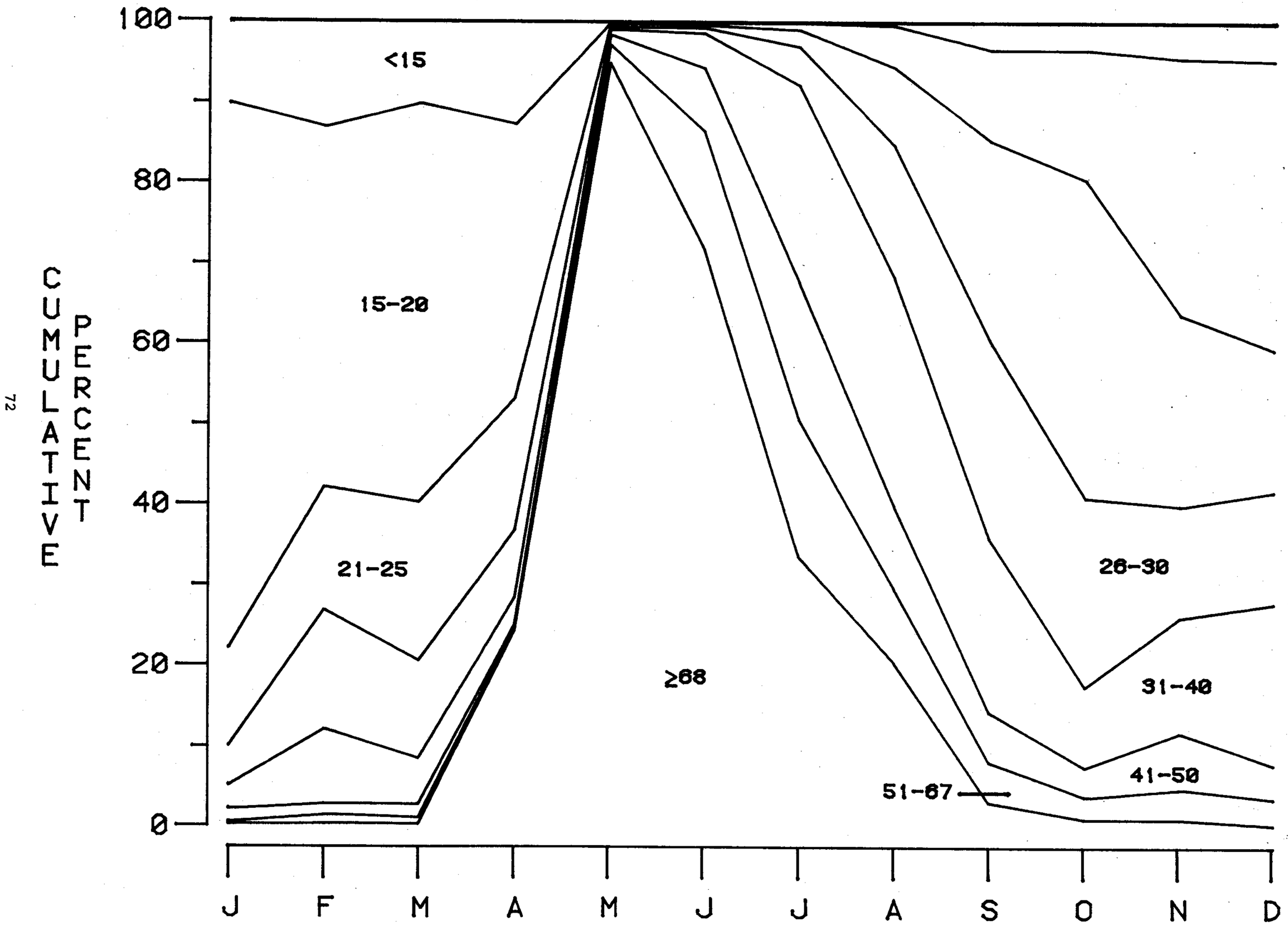
J F M A M J J A S O N D

BROWN SHRIMP
MISSISSIPPI RIVER TO TEXAS
1981



BROWN SHRIMP
PENSACOLA TO THE MISSISSIPPI RIVER
1981